Collaboration between older adults and clinicians in the emergency department: Role of the complex sociotechnical systems

By

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A dissertation submitted in partial fulfillment of

the requirements for the degree of

Doctor of Philosophy

Industrial and Systems Engineering

at the

UNIVERSITY OF WISCONSIN – MADISON

2023

Date of final oral examination: 06/01/2023

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Dedication

I dedicate this dissertation to my brother, George, in honor of the challenges he has endured and the resilience of his spirit.

Acknowledgements

First, I must express my thanks and gratitude to my PhD advisor, Pascale Carayon, who encouraged me to pursue a PhD. Throughout my PhD, we have cultivated a relationship that I know we will both cherish for a lifetime, or so she tells me. As her last PhD student, I hope to carry forth a fraction of her legacy as an engineer, researcher, teacher, colleague, and advisor.

I would like to thank my dissertation committee, Nicole Werner, Douglas Wiegmann, Mary Sesto, and Manish Shah for their encouragement, mentorship, and input into my dissertation research. A special thank you to Peter Hoonakker for inviting me into his home and never forgetting to remind me to write and to Paula vW. Dail whose generosity and wisdom were incredibly valuable. Thank you to the BerbeeWalsh Department of Emegency Medicine, specifically Manish Shah, Brian Patterson, Michael Pulia, and Denise Buckley for sharing their time and insights into my dissertation research. Thank you to the Agency for Healthcare Research and Quality [Grant: 5R18HS026624], the Clinical and Translational Science Award (CTSA) program, through the NIH National Center for Advancing Translational Sciences (NCATS) [Grant: UL1TR002373], and the National Institute on Aging [Grant: K24AG054560] for funding this research.

I must recognize and thank my family, John, Elizabeth, Linnea, and George Wust for always believing in me and expecting nothing less than exactly what I am capable of. Thank you to my husband, Benjamin McBroom, who has been there to celebrate every high and encourage me through every low during my PhD. To my in-laws, Barb, Jeff, Steven, Lindsay, Laura, and my nephew, Christo McBroom, thank you for supporting me despite not always understanding what

it is I am doing or why I am doing it. Finally, thank you to my kitty, Bubba, who has unknowingly provided copious amounts of emotional support.

Thank you to my colleagues who quickly became friends, Bat-Zion (Betsy) Hose and Megan Salwei. Your friendship and support were some of the reasons I chose to pursue a PhD and are a huge reason why I will get one. Betsy, thank you for instilling confidence in me, laughing with me, complaining with me, and talking with me about all things research and life. Megan, thank you for your mentorships and willingness to always join me for happy hour.

Kathryn Wust McBroom

Abstract

The discharge process occurs at the end of an ED visit and often includes information and education with ED clinicians on how the patient should care for themselves at home. For older adults, the discharge process is fraught with challenges (e.g., ineffective communication), which may result in poor patient safety and experience. Interventions designed to target the ED discharge process often result in meager improvements to patient safety and experience; this may result from an insufficient understanding of the ED discharge process and older adult-ED clinician collaboration.

The purpose of this dissertation research was to gain a deep understanding of older adult and ED clinician collaboration during the ED discharge process. I conducted two qualitative studies aimed at developing a detailed process map, defining collaboration during the discharge process, and identifying and comparing older adult and ED nurse perspectives of work system barriers and facilitators during operational discharge. Using 7 patient-centered observations and 7 interviews with ED physicians and nurses, I developed a detailed discharge process map that consists of 14 activities, which include collaboration, patient work, and clinician work. Collaboration occurred in seven of the 14 discharge activities and included instances of learning, coordinating, and communicating interactions. Further, through the analysis of 15 older adult and 10 ED nurse interviews, I identified 16 dimensions that encompass six work system elements and their interactions. The 16 dimensions represent barriers and facilitators to collaboration during operational discharge. Within these 16 dimensions, older adults and ED nurses report common, unique, and divergent work system barriers and facilitators.

The results of my research extend our understanding of how the work system affects patient and clinician collaboration during complex care processes, such as the ED discharge process. Further, my results highlight the importance of using a systems approach that includes multiple perspectives to understanding collaboration in complex care process, which was shown in the identification of common, unique, and divergent work system barriers and facilitators. Practically, my results can be used by researchers and practitioners as a starting point for the analysis of collaboration in their own context, patient population, or care setting or as input into the design of interventions for the ED discharge process.

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Chapter 1: Introduction

1.1 Problem Statement: Older Adults in the Emergency Department (ED)

Older adults constitute a large proportion of visits to the ED (>20%) (Cairns & Kang, 2020) and often have a poor experience while in the ED (Goodridge et al., 2018; Kolk et al., 2021; Nerney et al., 2001). Further, older adults are at risk of poor patient safety outcomes after an ED visit, e.g., functional decline, repeat ED visits, unplanned hospitalization (Aminzadeh & Dalziel, 2002; Schnitker et al., 2011; Stiell et al., 2003). A critical component of an older adult's ED care is the care transition between the ED and home, i.e., the discharge process (Coleman, 2003; Coleman & Boult, 2003). The discharge process occurs at the end of an older adult's ED visit and often includes information and education with an ED clinician (e.g., ED nurse) on how the patient should care for themselves at home. Research has found that inadequate instructions and ineffective communication during the discharge process negatively affect older adults' experience in the ED and may contribute to poor patient safety outcomes (e.g., return visits to the ED) (Goodridge et al., 2018; Kolk et al., 2021). Further, the negative experiences of older adults in the ED conflict with what they value, such as having a clear plan for how to care for themselves at home (Vaillancourt et al., 2017). Therefore, understanding what happens during the discharge process is necessary to improve older adults' experience in the ED and post-ED patient safety outcomes.

Researchers have identified multiple challenges that older adults face during the discharge process, including: insufficient length of the process (Rhodes et al., 2004; Vashi & Rhodes, 2011), inadequate information provided by clinicians (Palonen et al., 2015; Vashi & Rhodes, 2011), no provision of discharge instructions (Taylor & Cameron, 2000b), and older adult's

limited comprehension of discharge instructions (Clarke et al., 2005; Hastings et al., 2011; Sheikh et al., 2018; Spandorfer et al., 1995; Williams et al., 1996). In response to the challenges faced during the discharge process, many studies have designed and evaluated interventions aimed at improving the older adult's care transition out of the ED. Reviews by Gettel et al. (2021), Hastings et al. (2011), and Lowthian et al. (2015) have synthesized the literature on interventions designed to improve older adult's care transitions out of the ED. These interventions are composed of one or more components, including screening tools (e.g., Identification of Seniors at Risk (ISAR), care coordination, geriatric assessment, discharge planning, follow-up (e.g., in-person, telephone), ED nurse education, and home/community-based services (e.g., rapid referral/liaison for primary care physician (PCP), home health services) (Gettel et al., 2021; Hastings et al., 2011; Lowthian et al., 2015). Accounting for the diversity of these older adult care transition interventions, the studies report mixed results for improvement of patient safety and patient experience outcomes (Gettel et al., 2021; Hastings et al., 2011). Further, the meta-analysis by Lowthian et al. (2015) on patient safety and experience outcomes across nine ED care transition intervention studies showed no effectiveness on reducing repeat ED visits or hospitalizations and minimal effect on improving functional status or reducing nursing home admissions.

Many interventions are not specific to older adults but are designed specifically to address challenges during the discharge process. These interventions include integrating the teach back method into the discharge process (Griffey et al., 2015; Hesselink et al., 2021; Mahajan et al., 2020; Slater et al., 2017), redesigning the ED discharge instructions (Bell et al., 2013; Hoek et al., 2021; Jolly et al., 1995), including a pharmacist in the discharge process (Cesarz et al., 2013;

Lineberry et al., 2021; Zdyb et al., 2017), and use of a discharge coordinator (Guttman et al., 2004). Despite the variety of intervention types and the discharge problems they try to address, these studies present mixed results. This may be because these studies design and implement the intervention without a sufficient understanding of what occurs during the discharge process. In other words, they fail to understand the collaborative work that older adults and clinicians do together during the discharge process.

The Systems Engineering Initiative for Patient Safety (SEIPS) 2.0 model describes the process element as containing three types of work: professional work, patient work, and collaborative professional-patient work (i.e. collaboration) (Holden et al., 2013). Collaboration has been defined as "an evolving process whereby two or more social entities actively engage in joint activities aimed at achieving at least one shared goal" (Bedwell et al., 2012). Collaboration falls within the process element of the SEIPS model (Carayon et al., 2006; Carayon et al., 2020; Holden et al., 2013), which provides a mechanism for understanding how the work system elements interact, i.e., people (older adult, ED nurse) performing tasks using tools and technology within an organizational and physical environment, resulting in barriers or facilitators to the collaboration, affecting older adult outcomes (e.g., patient experience, post-ED patient safety outcomes). I did not identify any studies that integrate the concept of collaboration and the SEIPS model to understand the ED discharge progress and how older adult and ED clinician collaboration occurs during the process. A few studies have used the SEIPS model to analyze multiple perspectives in complex health care processes (Kelly et al., 2019; Montague & Kleiner, 2009; Musuuza et al., 2019; Schultz et al., 2007; Werner et al., 2021). Yet, none have evaluated older adult and ED nurse perspectives of collaboration during the ED discharge process;

specifically, the work system barriers and facilitators to collaboration during the ED discharge process and whether older adults and ED nurses have similar, unique, or divergent perspectives on the perceived barriers and facilitators.

My research focuses on the collaboration that occurs between older adults and ED clinicians during the ED discharge process. Using the SEIPS model, my work will describe how collaboration occurs during the ED discharge process, identify work system barriers and facilitators to collaboration, and compare older adults' and ED nurses' perspectives of the barriers and facilitators to collaboration.

1.2 Research Questions

The goal of this research is to understand the collaboration that older adults and ED clinicians engage in during the discharge process in the ED; and to identify the barriers and facilitators to collaboration from the perspectives of older adults and ED nurses. My research questions are:

RQ1: What activities compose the ED discharge process and how does collaboration occur between older adults and ED clinicians during the ED discharge process?

RQ2A: How do work system barriers and facilitators affect older adult and ED nurse collaboration during the operational discharge process?

RQ2B: How do the barriers and facilitators experienced by older adults and ED nurses to collaboration during the operational discharge process compare?

1.3 Research Contributions

Care transitions, such as older adults' discharge from the ED, present challenges for patient safety and experience but also opportunities to provide high-quality, safe care. Further, the ED

discharge is a care process where the older adults and ED clinicians collaborate to help prepare the patient to care for themselves at home. My research makes an important contribution by providing a detailed description of the ED discharge process and how older adults and ED clinicians collaborate during the ED discharge process. Further, using a systems approach (i.e., SEIPS), my research identifies how the work system affects older adult – ED nurse collaboration during the discharge process. Lastly, my research helps us to understand how the different perspectives (i.e., older adults and ED nurses) perceive the work system barriers and facilitators they experience while collaborating.

1.4 Structure of the Proposal

The remainder of this proposal includes a literature review, presentation of research questions, methods, results, discussion, and conclusion. Chapter 2 features a literature review of older adult care transition interventions in the ED, discharge interventions in the ED, summary of work system models, and definition of collaboration. Chapter 3 highlights the research question development. Chapter 4 presents the researcher's worldview and proposes methods to answer the research questions. Chapters 5 presents the results and discussion for research question 1. Chapter 6 presents the results and discussion for research questions 2A and 2B. Lastly, chapter 7 presents a discussion that synthesizes the results of the two research questions, study strengths and limitations, and future work. Lastly, chapter 8 concludes the dissertation.

Chapter 2: Literature Review

2.1 Older adults in the Emergency Department

Older adults in the U.S. presented to the ED over 26 million times in 2020, representing over 20% of all ED visits (Cairns & Kang, 2020). Older adults are at risk for negative patient safety outcomes and patient experience during and after an ED visit. While in the ED, older adults can experience communication and coordination challenges (NASEM, 2018), e.g., information gaps, which may increase their length of stay (Stiell et al., 2003), and can be further exacerbated by the time and resource constraints in the ED (Perry et al., 2012). After an ED visit, older adults are at risk of negative patient safety outcomes, such as increased length of stay in the ED, functional decline, unplanned hospitalization, and repeat ED visits (Aminzadeh & Dalziel, 2002; Gabayan et al., 2013; Schnitker et al., 2011; Stiell et al., 2003).

Older adults, care partners, and clinicians have reported aspects of care in the ED that contribute to a negative experience. For example, 41% of older adults report that the time spent in the ED is too long (Nerney et al., 2001). Further, older adults report ageism, poor communication with ED clinicians, feelings of abandonment, and lack of responsiveness to their unique care needs during the discharge process (e.g., inadequate discharge instructions) (Goodridge et al., 2018; Kolk et al., 2021). From a clinician perspective, the ED lacks geriatric-specific care processes, care continuity, attention to basic and patient-centered care needs, and a culture welcoming to older adults (De Brauwer et al., 2021). These negative experiences of older adults in the ED have consequences that extend beyond the initial ED visit. For example, in a qualitative study of 13 older adults who revisited the ED, Kolk et al. (2021) found that older adults mentioned unclear diagnoses, clinicians focus on somatic care rather than the psychological and social needs of older adults, and insufficient discharge communication (e.g., no discharge instructions) as factors

that contributed to ED recidivism. The negative experiences of older adults in the ED may result from a mismatch between what they experience and what they value.

Studies have found that older adults value the patient-clinician relationship in the ED. The patient-clinician relationship is positively influenced by effective communication and involvement in medical decision making and negatively affected by lack of attention to the patient's unique emotional and psychosocial needs. Older adult patients value a holistic, patient-centered care approach (Gordon et al., 2010; Shankar et al., 2014; van Oppen et al., 2019), which is positively influenced by involvement of the patient's care partner (e.g., spouse, adult child). In a qualitative study on patients' perspectives on care outcomes after an ED visit, Vaillancourt et al. (2017) found that patients value symptom relief, reassurance, having a plan for self and medical care, and understanding of diagnosis and prognosis. Because older adults place value on the patient-clinician relationship that has the potential to positively affect their experience in the ED, it is important to understand what occurs during older adult and clinician interactions. Understanding older adult and clinician interactions is especially critical during care transitions because they represent a high-risk care process that requires effective information, authority, and responsibility transfer (Carayon & Wood, 2010). While care transitions are high risk, they also present an opportunity to improve patient safety along the continuum of the patient journey (Carayon et al., 2020). One aspect of an older adult's transition out of the ED is the discharge process.

2.1.1 Previous research on geriatric interventions in the ED

Several studies have developed and evaluated interventions aimed at improving patient safety outcomes and experience of older adults in the ED. Multiple systematic and scoping reviews have been published to synthesize and review interventions for older adults in the ED (Hughes

et al., 2019; Karam et al., 2015; Preston et al., 2021). These interventions address multiple activities and time points throughout the older adult's ED stay, which include: a geriatric ED, geriatric assessments, discharge planning, case management, medication safety and management (Hughes et al., 2019; Karam et al., 2015). Two key conclusions from these literature reviews are:

1. Interventions that bridge the ED to next care setting (e.g., home) transition are associated with improved outcomes (Hughes et al., 2019; Preston et al., 2021).
2. Future research should involve key stakeholders (e.g., older adults, care partners) and consider more patient-centered outcomes (e.g., patient experience) (Hughes et al., 2019).

Multiple literature reviews focus specifically on older adult care transition interventions (Gettel et al., 2021; Hastings & Heflin, 2005; Lowthian et al., 2015). Table 1 synthesizes the objectives, methods, and findings from these studies. Interventions include screening tools (e.g., Identification of Seniors at Risk (ISAR), care coordination, geriatric assessment, discharge planning, follow-up (e.g., in-person, telephone), ED nurse education, and home/community-based services (e.g., rapid referral/liaison for PCP, home health services) (Gettel et al., 2021; Hastings & Heflin, 2005; Lowthian et al., 2015). Despite the diversity and reach of these interventions, studies report mixed results on improving patient safety and patient experience (Gettel et al., 2021; Hastings & Heflin, 2005). Further, the meta-synthesis by Lowthian et al. (2015) showed no effect from the interventions on reducing repeat ED visits or hospitalization and minimal effect on functional status and nursing home admission. Overall, Hastings (2005) concluded that future research is needed to better understand the discharge process for older adult patients, specifically system and patient-centered factors.

Table 1. Synthesis of literature reviews for older adult care transition interventions**.**

Studies	Title	Objective	Methods	Results
Gettel et al. (2021)	Care transitions and social needs: A Geriatric Emergency care Applied Research (GEAR) Network scoping review and consensus statement	"to describe the type, frequency, and associated clinical outcomes of ED care transition interventions that have addressed social needs in older adults."	• Scoping review • Databases: OVID MEDLINE, Embase, CINAHL, and Cochrane Central • Inclusion criteria ○ Older adults (≥ 65 yrs) ○ Interventions addressing care transitions (e.g., discharge planning, care coordination, information transfer, telephone or in-person follow-up) ○ Includes outcome related to healthcare utilization, mortality, cost, patient-reported outcomes	17 studies identified, covering interventions related to • Care coordination (8) • Geriatric assessment (7) • Discharge planning (4) • In-person follow-up (5) • Telephone follow-up (5) 14 of the 17 studies addressed at least one social determinate of health and 5/17 addressed at least 5 social determinates of health **Main finding:** mixed results in effectiveness of addressing the identified outcomes and on their impact on social determinates of health
Hastings et al. (2005)	A systematic review of interventions to improve outcomes for elders discharged from the emergency department	"to evaluate the evidence for interventions designed to improve outcomes for elders discharged from the emergency department."	• Systematic review • Databases: MEDLINE and CINAHL • Inclusion criteria ○ Interventions to improve outcomes for older adult discharged from the ED • Exclusion criteria ○ Interventions that address a patient population limited to a single presentation or diagnosis ○ Interventions that address patients who would	27 studies identified, including a mix of observation studies, clinical trials Observational studies covered interventions related to: • Telephone follow-up • Specially trained ED nurse or team for geriatric assessment • ED nurse education on geriatric issues • Home based services (e.g., rapid referral, home health services)

			otherwise be hospitalized (i.e., not discharged from ED)	Clinical trials covered interventions related to: • ED nurse discharge coordinator • ED nurse case management • Geriatric assessment • Use of Identification of Seniors at Risk (ISAR) screening tool • Home based services (e.g., home health services) **Main finding:** mixed results on improvement of older adult functional status and clinical-based outcomes (e.g., hospital admissions, return ED visits)

Lowthian et al. (2015)	Discharging older patients from the emergency department effectively: a systematic review and meta-analysis	"to conducted a systematic review with meta-analysis to
		
		(i) profile effective care transition models and
		
		(ii) provide robust estimates of effect of these care models on risk of ED re-presentation or hospitalization, functional decline in activities of daily living (ADL), nursing-care home admission and mortality in older people discharged home from ED."
			• Systematic review and meta-analysis
			• Database: CINAHL
			• Inclusion criteria
			  ○ Older adults (≥ 65 yrs)
			  ○ Studies that reported the effectiveness of ED-based discharge and care transitions interventions
			  ○ Included outcomes related to ED revisit, hospitalization, functional decline, nursing home admission, and death
			• Exclusion criteria
			  ○ Interventions that address a patient population limited to a single presentation or diagnosis
				11 articles describing 9 studies were included, covering interventions related to:
				• Geriatric assessment
				• Community-based referral/ services
				• Telephone follow-up
				• PCP liaison
				Main findings: meta-analysis showed no effectiveness of ED interventions on reducing repeat ED visits or hospitalization and minimal effect on functional status and nursing home admission.

			○ Interventions that included patients who were hospitalized	

2.2 Emergency department discharge process

2.2.1 Defining the ED discharge process

The ED discharge process is a care transition that is part of an older adult's patient journey. Care transitions have been defined as "a set of actions designed to ensure the coordination and continuity of health care as patients transfer between different locations (e.g., ED to home)" (Coleman, 2003; Coleman & Boult, 2003). The discharge process is a part of the care transition between the ED and home, occurring at the end of an older adult's ED visit and often including a discussion between the older adult and ED nurse about the discharge instructions. A report by the Agency for Healthcare Research and Quality identified three characteristics of a high-quality ED discharge process: (1) communication and education with patients (e.g., diagnosis, prognosis, treatment plan, disease protectory); (2) information and support for post-ED care, also called discharge planning (Nickel et al., 2018) (e.g., medication management, use of medical devices, wound care, follow-up care); and (3) coordination of post-ED care (e.g., appointment with primary care physician) (Boonyasai et al., 2014).

2.2.2 Previous research on discharge process

2.2.2.1 Research describing the discharge process

The discharge process is particularly challenging, especially within the resource constrained ED (Perry et al., 2012). Studies have evaluated the ED discharge process from using multiple metrics, including:

1. *Length of the process.* Studies have shown that the discharge process lasts from 76 seconds (Rhodes et al., 2004) to 4 minutes on average (Vashi & Rhodes, 2011). Further, during the process, there is often little time for patients to ask questions, with one study finding patient questioning to last only 14 seconds (Rhodes et al., 2004).

2. *Information provided by clinicians.* One study found that clinicians often do not provide any information or education during the discharge process (Palonen et al., 2015) and when information and education is provided, it is often inadequate and excludes key components of the discharge instructions (e.g., post-ED follow-up, symptoms that warrant a return visit to the ED) (Vashi & Rhodes, 2011).
3. *Provision of discharge instructions.* Patients may not receive printed discharge instructions (Taylor & Cameron, 2000b).
4. *Patient comprehension of discharge instructions*. Multiple studies have found that patients experience challenges comprehending discharge instructions (Clarke et al., 2005; Hastings et al., 2011; Sheikh et al., 2018; Spandorfer et al., 1995; Williams et al., 1996). For example, a study by Engel et al. (2012) found that 93% of patients had a knowledge deficit in understanding their discharge instructions. In a systematic review and meta synthesis of 22 studies on discharge instruction modality and comprehension, Hoek et al. (2020) report that patients only had 57.8% correct recall for written discharge instructions. In a focus-group study that asked patients how to improve discharge instructions, eight themes were identified: (1) define complex words and concepts, (2) present contextual framework and motivational information, (3) provide practical information and examples, (4) clarify uncertainty and manage expectations, (5) use visual aids, (6) address inappropriate commonly accepted practices, (7) provide logical flow of information, and (8) emphasize key points (Buckley et al., 2013). The number of areas for improvement identified by patients highlights why they may struggle to comprehend the discharge instructions.

In studies evaluating the ED discharge process, multiple challenges have been identified. The ED discharge process may not help older adults and their care partners prepare for the next step in their patient journey (Palonen et al., 2015) and may possibly result in adverse patient outcomes (e.g., repeat ED visit, hospitalization, death) (Hastings et al., 2011). Interventions have been developed to address these challenges with the ED discharge process to improve the older adult-clinician interactions by: (1) increasing the time spent during the discharge process, (2) improving the information provided by clinician, (3) improving the provision of discharge instructions, and (4) increasing patient comprehension of discharge instructions.

2.2.2.2 Previous research on interventions to improve the discharge process and future research opportunities

Many studies have designed interventions to improve the ED discharge process, with a focus on communication with the patient during the discharge process, discharge instructions and patient comprehension, inclusion of a pharmacist in the discharge process, and use of technology-based discharge navigator or discharge coordinator; see Table 2.

Table 2. Studies on ED discharge interventions.

Discharge interventions	Aimed at addressing	Studies
Communication with patient during discharge process	Information provided by clinicians	Griffey et al. (2015), Hesselink et al. (2021), Mahajan et al. (2020), Slater et al. (2017)
Discharge instructions and patient comprehension	Provision of discharge instructions Patient comprehension of discharge instructions	Jolly et al. (1995), Hoek et al. (2021), Bell et al. (2013)
Pharmaceutical interventions (e.g., medication management, inclusion of pharmacist in discharge process)	Information provided by clinicians	Cesarz et al. (2013), Lineberry et al. (2021), Zdyb et al. (2017)
Discharge coordinator	Length of process Information provided by clinicians	Grade et al. (2022), Guttman et al. (2004), Corbett et al. (2005), Jacobsohn et al. (2021)

Communication during discharge process

Multiple studies have focused on interventions to improve communication between patients and clinicians at the time of ED discharge. One subset of these interventions focuses on a method of patient education called the teach back method (Griffey et al., 2015; Hesselink et al., 2021; Mahajan et al., 2020; Slater et al., 2017) that was identified by DeWalt et al. (2011) as part of the Health Literacy University Precautions Toolkit. The teach back method asks patients to recount in their own words what they have been told by their clinician, which helps the clinician to ensure that they were clear in their explanation and that the patient understands instructions (DeWalt et al., 2011).

Table 3 outlines four studies that analyzed the teach back method for patient comprehension of discharge communication. These studies involve an ED clinician (e.g., nurse) who performs the teach back with the patient during the discharge process. After the discharge process, the patients are interviewed to assess their comprehension on different aspects of their discharge communication, such as diagnosis, ED care (e.g., testing in ED, treatment in ED), post-ED care (e.g., medications, self-care, follow-up), and return instructions.

The studies present mixed results for patient comprehension of discharge instructions and other measures (e.g., length of discharge communication, return visits within 8- or 30-days post-ED, satisfaction). For instance, Griffey et al. (2015) only found improvement in patient comprehension on information related to post-ED care, whereas Mahajan et al. (2020) found improvement in patient comprehension on information related to diagnosis, ED care, post-ED care, and return instructions. The mixed results may be related to lack of basic understanding of what occurs during the discharge process; therefore, the intervention does not fit with the actual work system. None

of the included studies analyzed what occurs during the discharge process before integrating the teach back method. Further, none of the studies identified barriers or facilitators to using the teach back method, yet many studies speculated about these as part of their discussion. A commonly identified potential barrier was time constraints in the ED (Griffey et al., 2015; Mahajan et al., 2020; Slater et al., 2017), yet one studied found that using teach back decreased the amount of time spent communicating at discharge (Hesselink et al., 2021), which helped facilitate an efficient discharge process. Other identified barriers involved the patient, such as a patient's potential reluctance to state what they do not know (Griffey et al., 2015) or inability to identify knowledge deficits (Slater et al., 2017). Lastly, results of the studies only include the patient (Griffey et al., 2015; Mahajan et al., 2020; Slater et al., 2017) or the patient and care partner (Hesselink et al., 2021) perspective, excluding the perspective of the ED clinicians performing teach back.

Table 3. Synthesis of studies using teach back method.

Studies	Objective	Methods and results	Analysis of discharge process	Perspectives included	Identified work system barriers (B) and facilitators (F)
Griffey et al. (2015)	to evaluate the efficacy of teach-back in improving comprehension at the time of dis- charge among low health literacy patients in the ED setting	Methods • Randomized control trial • Adults (≥ 18 yrs) • Teach back provided by ED nurse • Patients scoring 6 or less on the Rapid Estimate of Adult Literacy in Medicine-Revised were randomized and provided discharge education from a RN using standard education or teach back. • Immediately after discharge patients participated in a structured interview about satisfaction with ED care and instructions and comprehension and perceived comprehension on four discharge domains (diagnosis, ED care (e.g., testing in ED, treatment in ED), post-ED care (e.g., medications, self-care, follow-up), and return instructions) Results • Statistically significant results on comprehension found in only one of four of the aspects of discharge communication (i.e., post-ED care) • No statistically significant results for perceived comprehension or patient satisfaction	No	Patient	• B: Time burden of teach back • B: patients reluctant to state that they do not understand discharge instructions

Hesselink et al. (2021)	to determine whether teach- back in the ED is feasible and might reduce (unplanned) ED revisits. In addition, we sought to determine whether teach back would improve older patients' comprehension and retention of discharge instructions, self-management at home and satisfaction with the provision of the discharge instructions	Methods • Pre-post pilot study • Older adults (≥ 70 yrs) and care partner • Teach back provided by ED nurse, physician, or resident • Within 72 hours of discharge patients and/or care partner were interviewed over the phone using a semi structured interview about the information they were provided at discharge on five domains (ED diagnosis and treatment, medication in the ED, post-ED care, follow-up, return instructions) and their satisfaction. They were also asked four questions from the Patient Activation Measure Results • No statistically significant difference in 8 or 30 day return visits • Numerically higher full retention on all five domains for patients receiving teach back • No statistically significant difference in patient satisfaction	No	Patient Care partner	• F: reduced time spent providing discharge communication
Mahajan et al. (2020)	to analyze the isolated effect of the teach back method on both direct and delayed re- call in a general ED population	Methods • Prospective cohort study • Adults (≥ 18 yrs) • Teach back provided by ED nurses • Immediately after discharge patients participated in a structured interview to access comprehension on four discharge domains (diagnosis, ED care, post-ED care, and return instructions). • 2-4 days post discharge the same semi-structured interview was conducted with patients over the phone	No	Patient	• B: Time burden of teach back • F: Teach back only adds ~2 minutes to discharge communication

		Results • Improvement in patient comprehension for all four domains for teach back at discharge and 2-4 days post discharge			
Slater et al. (2017)	to determine whether teach back used in the ED to supplement the standard written and verbal discharge instructions can increase patient retention of instructions at a follow-up phone call	Methods • Pre-post pilot study • Adults (≥ 18 yrs) • Teach back provided by ED nurses • Within 6-30 hours after discharge patients and/or care partner were interviewed over the phone to access comprehension on four discharge domains (diagnosis, follow-up instructions, medications, and return instructions). Results • Statistically significant increase in diagnosis comprehension • No statistically significant increase in medication comprehension • Overall, recall was 15% higher in teach back group	No	Patient	• B: Time burden of teach back • B: Patients unaware of knowledge deficits

Discharge instructions and patient comprehension

The content, structure, delivery, and comprehension of ED discharge instructions has been extensively researched. Discharge instructions are a document given to the patient and care partner during the discharge process that often includes important clinical information and education, such as diagnosis, summary of care received in the ED, post-ED care instructions, medication, and follow-up (Taylor & Cameron, 2000a). In a review of the literature on communication of ED discharge instructions, Samuels-Kalow (2012) identified four components of the discharge instruction process that interventions have tried to address: (1) content, (2) delivery (written and verbal), (3) patient comprehension, and (4) implementation of the instructions by the patient. Table 4 synthesizes multiple studies on interventions that address the components of discharge instructions process.

Studies about interventions for the discharge instructions focus on the (1) content of the discharge instructions (Bell et al., 2013; Jolly et al., 1995) and the (2) delivery of the discharge instructions (Hoek et al., 2021). There were no studies identified that focused on (3) patient comprehension of discharge instructions or (4) patient implementation of the discharge instructions. The studies present mixed results for interventions that address content of the discharge instructions (Bell et al., 2013; Jolly et al., 1995). The study by Jolly et al. (1995) found no statistically significant difference on patient comprehension between an original and simplified discharge instruction. The study by Bell et al. (2013) found that using an electronic discharge instruction module helped to ensure completeness of the discharge instructions, but researchers did not evaluate how the new discharge instructions affected the patient-clinician collaborative work during the discharge process or how patients comprehended the new instructions. Lastly, the study by Hoek et al. (2021) evaluated the delivery of discharge instructions through implementation of video discharge

instructions, finding no increase in correct recall and minimal increase in satisfaction for the video discharge instructions versus written discharge instructions. These mixed results may be explained by an insufficient understanding of what occurs during the ED discharge process; resulting in interventions that do not fit within the work system. Further, none of the studies evaluated how the patient and ED clinician collaborated during the ED discharge process using the discharge instruction, nor did any of the studies identify work system barriers or facilitators to the implementation of the discharge instruction in the discharge process. Lastly, the included studies only evaluated the ED discharge instructions from the patient (Hoek et al., 2020; Jolly et al., 1995) or clinician perspective (Bell et al., 2013); none of them looking at both the patient and clinician perspective concurrently.

Table 4. Synthesis of studies on discharge instructions and patient comprehension.

Studies	Objective	Component of discharge instruction addressed	Methods and results	Analysis of discharge process	Perspectives included	Identified work system barriers (B) and facilitators (F)
Jolly et al. (1995)	to discern the ability of emergency department patients to understand simplified versions of standard discharge instructions	Content	Methods • Adults (≥ 18 yrs) • Simplified discharge information sheets were given to patients and asked questions about instructions Results • No statistically significant difference on patient score between original and simplified discharge information sheets	No	Patient	None
Hoek et al. (2021)	to test whether video discharge instructions in the ED reduced post concussion symptoms after 3 months in patients with mild traumatic brain injury	Delivery	Methods • Randomized control trial • Adults (≥ 18 yrs) with mild traumatic brain injury • Intervention included verbal, written, and video discharge instructions. The video was developed using Dutch national guidelines by educators at the Dutch Brain Foundation and a production company experienced in patient education and was review by clinician and patient representatives. Results • No statistically significant difference in concussion symptoms between control and intervention groups • No difference in correct recall of discharge instructions (i.e., diagnosis, therapy, return instructions)	No	Patient	None

			• Minimal difference in satisfaction of discharge instructions			
Bell et al. (2013)	evaluation of the completeness of ED discharge instructions before and after implementation of an electronic discharge instruction module	Content	Methods • Quasi-experimental study • Patients discharged home from ED • Implementation of an electronic discharge instruction module designed by Ed physicians, nurse, health IT, and coding/compliance • Electronic discharge instruction module included five key elements from Centers for Medicare and Medicaid Services Outpatient Measure 19: o Diagnosis o Procedures and tests o Patient care instructions o Follow-up instructions o Medications Results • Electronic discharge instructions completed with a 97.3% compliance rate	No	ED physicians ED nurses Health IT Coding/compliance	None

Integration of a pharmacist in the discharge process

ED discharge interventions have also focused on inclusion of a pharmacist during the discharge process (Cesarz et al., 2013; Lineberry et al., 2021; Zdyb et al., 2017), see Table 5. A couple of studies have integrated the ED pharmacist into the discharge process to review prescriptions at discharge to identify and correct medication errors and optimize medication therapy (Cesarz et al., 2013; Lineberry et al., 2021). One study by Zdyb et al. (2017), developed and implemented a pharmacist-led patient education program at discharge for patients prescribed anticoagulants in the ED. They found that patients who received the pharmacist-led education had improved medication adherence and were less likely to return to the ED.

The three included studies showed low uptake of the intervention. The ED pharmacist was only involved in the discharge process for 10.1-18.5% of patients (Cesarz et al., 2013; Lineberry et al., 2021). Further, the study by Lineberry et al. (2021) identified 73 missed opportunities for the ED pharmacist to be involved in the discharge process; 43% of the missed opportunities were for patient education on prescription medications. The relatively low intervention rate and missed opportunities may result from lack of a detailed understanding of the ED discharge process, as none of the included studies analyzed the work system to inform intervention development. Two of the studies speculated on potential work system barriers or facilitators to pharmacist's involvement in the discharge process. Cesarz et al. (2013) identified the pharmacists' limited work schedule as a potential barrier to their involvement in the discharge process. Lineberry et al. (2021) speculated that the pharmacists' ability to change the patient's prescription was a facilitator to their involvement in the discharge process. The study by Zdyb et al. (2017) was the only study to look at the patient and pharmacist interaction during the discharge process; yet they did not study how

the patient and pharmacist collaborated during the medication reconciliation process, nor did they include the patient perspective in the design or evaluation of the intervention.

Table 5. Synthesis of studies integrating pharmacist in discharge process.

Studies	Objective	Methods and results	Analysis of discharge process	Perspectives included	Identified work system barriers (B) and facilitators (F)

Cesarz et al. (2013)	to determine the rate and types of intervention associated with emergency medicine pharmacist review of prescriptions for patients being discharged from the ED.	Methods
		• Prospective observational study
		• Pediatric and adult patients
		• 4 ED pharmacists reviewed computerized physician order entry of medications for medication errors and optimization of therapy. If medication error or opportunity for optimization of therapy was detected, pharmacist contacted the ED attending physician, who made the final decision. A satisfaction survey was sent to ED pharmacist, attending physicians, residents, and nurses 4 months post-intervention.
		Results
		• 10.1% intervention rate (54% medication error, 46% optimization of therapy)
		• Positive response for ED clinician satisfaction survey
		  ○ 99% improved patient safety
		  ○ 96% optimized patient medication regimens
		  ○ 95% improved patient satisfaction
		  ○ 96% did not impair discharge efficiency
			No	ED pharmacist
				ED attending
				ED resident
				ED nurse
					• B: pharmacist schedule (7 am – 11 pm weekdays and 1:30 pm – 10 pm weekends)

Lineberry et al. (2021)	to develop and implement a prospective targeted discharge prescription review service and to evaluate both the feasibility and interventions resulting from emergency medicine pharmacist review	Methods • Retrospective review of pharmacist-driven clinical service • Developed electronic health record notification for high-risk pharmaceutical subclasses prescribed at discharge • Developed pharmacist workflow to integrate notification • Pharmacists would review discharge prescriptions and intervene based for wrong patient,	No	ED pharmacist Health IT ED clinicians	• F: pharmacist authorized to change prescriptions

		dose/frequency, suboptimal drug choice, dosage form, duration/ refills, unnecessary therapy/duplicate, drug or disease state interaction, erroneous prescription elements, allergy/intolerance history, education potential, medication access, monitoring, and other Results • 18.5% intervention rate • 73 missed opportunities to intervene ○ 41.1% of missed opportunities were opportunities to educate patient on the prescription			

Zdyb et al. (2017)	evaluation of the potential impact of pharmacist counseling on patient understanding and appropriate use of anticoagulant medications… after discharge from the ED	Methods
		• Retrospective medical record analysis
		• Patients prescribed an anticoagulant at discharge
		• ED pharmacist and physicians developed intervention that included:
		  ○ Bedside medication reconciliation (e.g., discussion of prescription and over-the-counter medication interactions, explanation of indication and appropriate use, primary care follow-up, patient questions)
		  ○ Follow-up call 24-72 hours post-discharge
		Results
		• 151 patients included
		• Bedside medication reconciliation reduced follow-up call intervention rate (36.4%-13%)
		• More patients who did not receive bedside mediation reconciliation required instructions on adherence and follow-up, experienced over-the-counter medication interactions, and had questions regarding indications of use, and returned to ED within 90 days
			No	ED pharmacist
				ED physicians
					None

Discharge navigation and coordination

Studies on discharge navigation and coordination have focused on use of technology and people to help patients during their care transition. In a review of the literature, one study was identified that developed a technology-based discharge navigation tool (Grade et al., 2022), two studies implemented a discharge coordinator (Corbett et al., 2005; Guttman et al., 2004), and one study implemented a community paramedic care transition intervention (CTI) (Jacobsohn et al., 2021; Jacobsohn et al., 2022) see Table 6.

The studies evaluated the intervention on several different outcome measures and, therefore, report an assortment of results. Yet, all three included studies showed positive results. In the technology-based discharge navigation tool study by Grade et al. (2022), the tool was evaluated on usability and increase in clinician's knowledge of resources available. Overall, clinicians found the tool relatively easy to use and useful in increasing their knowledge of existing community resources (Grade et al., 2022). Despite also including a patient-facing component to the intervention, patient outcomes were not measured. Further, how the patients and ED clinicians collaborated while using the tool was not evaluated. Both studies that implemented a discharge coordinator found an increase in patient satisfaction with the discharge process (Corbett et al., 2005; Guttman et al., 2004). Yet, inclusion of multiple perspectives in the discharge coordinator studies was mixed. The study by Corbett et al. (2005) assessed patient and ED clinician perspectives of the discharge coordinator intervention, whereas the study by Guttman et al. (2004) did not include the ED clinician perspective. The CTI studies by Jacobsohn et al. (2021; 2022) included outcome measures for older adults and the community-based paramedic, they found improvement in rates of seeking follow-up care and knowledge of "red flag" symptoms (i.e., reasons to return to the ED)

but no improvement in ED revisists or patient's medication adherence for discharged older adults. Further, they identified barriers to engagement with the intervention, as reported by the community-based paramedics (Jacobsohn et al., 2022).

None of the included studies conducted an in-depth analysis of the discharge process prior to implementing their interventions. Despite the lack of an in-depth analysis, they all identified potential work system barriers and facilitators to the discharge process. For example, Corbett et al. (2005) identified staffing of the care coordinators and their schedule as a barrier to their consistent integration in the discharge process. Jacobsohn et al. (2022) generated categories of barriers experienced by the community-based paramedics to the implementation of the CTI, one such barrier was lack of patient engagement in the follow-up visit and phone calls. Work system facilitators were also identified, such as reduced resources required by a digital discharge navigation tool (Grade et al., 2022), and patient participation in the discharge process (Guttman et al., 2004).

Table 6. Synthesis of studies on discharge navigation and discharge coordination.

Studies	Objective	Methods and results	Analysis of discharge process	Perspectives included	Identified work system barriers (B) and facilitators (F)
Corbett et al. (2005)	to streamline patient movement through the ED and to speed up allocation of services, thereby enabling a smooth and swift discharge	Methods • Older adults (≥ 65 years) • Care coordination staff consult with patient and ED medical team to develop discharge care plan, including post-discharge services (e.g., home help, nursing) • Pre-post evaluation using Assessment of Quality of Life (AQoL), ED clinician focus group, and patient satisfaction survey Results • Statistically significant decrease in number of patients admitted after ED presentation • Statistically significant increase post-intervention on AQoL (with small sample of n=11) • ED clinician focus group (n=19) found decreased pressure on discharge responsibilities and improved patient care • All patients agreed care coordination made the transition home easier to manage (n=11)	No	ED nurse Junior medical officers ED physicians Patient	• B: staffing (i.e., more demand than supply) • B: care coordinators schedule • B: referral of at-risk patients not streamlined
Grade et al. (2022)	to create a digital decision tool to help clinicians identify and link patients to social resources upon discharge.	Methods • Iterative design approach involving multiple perspectives • Discharge navigator digital tool accessible through electronic health record that provides customized recommendations for community-based resources for patients being discharged from the ED, providing ○ Education for clinicians and specific actions items for each resource	No	ED attendings ED residents Medical students ED nurses Social workers Hospital leadership Design specialists Patients	• F: digital tool requires fewer resources

		○ An educational handout for the patient that lists the resources available. Results • Clinicians found the tool relatively easy to use and useful in increasing their knowledge of existing community resources			
Guttman et al. (2004)	to evaluate the impact of an ED-based nurse discharge plan coordinator (NDPC) for elder patients on the number of unscheduled ED revisits.	Methods • Prospective pre-post design • Older adults (≥ 75 yrs) • Implementation of nurse discharge coordinator who tailored discharge plan to older adult's unique needs following an operationalized 6-step process: 1. assessed older adult patient's perceived ability to manage health problem, 2. discussed strategies with older adult patient for managing and treating health condition, 3. discharge instructions with medication and symptom management recommendations, 4. referral to community-based resources, 5. 24 hour post-discharge nurse follow-up call, and 6. one week of telephone availability for older adult patient and care partner questions and concerns post-discharge Results • Discharge coordinators spend an average of 20.7 minutes discussing discharge plan with older adult • Older adult patients were less likely to have an unscheduled revisit to the ED 8- and 14-days post-discharge • Older adults were more satisfied with the clarity of the information provided during	No	ED nurse discharge coordinators Patients	• B: discharge planning highly involved and time-consuming process • F: designated discharge coordinator • F: patient participation

		the discharge process and felt more prepared upon discharge			

Jacobsohn et al. (2021, 2022)	hypothesized that older adults randomized to receive the care transition intervention (CTI) (Mi et al., 2018; Shah et al., 2018) would have fewer ED revisits within 30 days, as well as perform self-management behaviors targeted by the intervention (outpatient follow-up, red flag identification, medication adherence), at higher rates than those receiving usual care.	Methods
		• Single-blind randomized controlled trial at 3 ED (2 New York, 1 Wisconsin)
		• Community-dwelling older adults (≥ 60 yrs)
		• Community paramedic care transition intervention (CTI) (Mi et al., 2018; Shah et al., 2018)
		    ○ Home visit from community paramedic 24-72 hours after discharge from ED. Discussed follow-up care, medications, "red flag" symptoms (i.e., reasons to return to ED), creation/review of personal health record, and health-related goal setting
		    ○ 1-3 coaching phone calls from community paramedic
		Results
		• No statistically significant difference in rates of ED revisits
		• CTI improved rates of seeking follow-up care
		• Improvement in knowledge of "red flag"
		• No improvement in medication adherence
			No	Patients
				Community paramedics
					• B: medication adherence requires patient behavioral change
					• B: absence of participant needs around a CTI pillar (e.g., no medication orders or changes, no need for follow-up care)
					• B: Patient medical symptoms (e.g., did not want to meet due to illness)
					• B: Coordination of phone call
					• B: patient engagement (e.g., resistant to content or discussion or behavioral changes)

2.2.2.2 Critical analysis of interventions on the ED discharge process

Studies to improve the ED discharge process have evaluated the communication with the patient during the discharge process, discharge instructions and patient comprehension, inclusion of a pharmacist in the discharge process, and use of technology-based discharge navigator, discharge coordinator, or CTI. Despite addressing many different components of the discharge process, these studies present inconsistent, mixed results. While some studies speculated on possible work system barriers and facilitators to their intervention's success, none of the studies used a systems approach to understanding the ED discharge process prior to implementing the intervention. This may have limited the ability of the interventions to affect change because there was no prior understanding to how it would integrate into the work system. Secondly, none of the studies evaluated how their interventions impact patient-clinician collaboration during the discharge process; in other words, how the patient and clinicians performed collaborative work using the intervention during the discharge process. Lastly, only a couple studies integrated multiple perspectives in the design or evaluation of the interventions, i.e., patient and ED clinician, that are involved during the discharge process. Therefore, I propose to research the ED discharge process using a systems approach with a focus on the collaboration between patients and ED clinicians.

2.3 Integration of sociotechnical and macroergonomic theory to understand the ED discharge process

2.3.1 Sociotechnical systems and macroergonomics perspective

The sociotechnical systems (STS) perspective originated in the 1950's at the Tavistock Institute of Human Relations (Trist & Bamforth, 1951). As part of their research on the long-wall coal-getting method, Trist and Bamforth (1951) found the social and technological aspects of work to be intrinsically related and tightly coupled. Integrating the social and technical aspects of work is

the defining element of the systems approach of human factors engineering (Dul et al., 2012; Kleiner, 2008; Wilson, 2000). This integration is reflected in how human factors engineering is defined, "Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance." (International Ergonomics Association, 2000), with the emphasis on interactions between people and the elements of the system.

The work of Hendrick (1991) integrated the systems approach from STS and ideas from organizational design and management, such as organizational structure, psycho-social characteristics, and the environment, thus establishing the concept of macroergonomics, a subset of human factors and ergonomics. From the macroergonomic perspective of Hendrick (1991), Kleiner (2008) identified five elements that comprise the STS, including: the personnel subsystem, technological subsystem, internal environment, organization and management, and external environment.

2.3.2 Work system and SEIPS model

In 1989, Smith and Carayon developed the work system model and balance theory, integrating the principles of STS and organizational design and management with theories of job design and stress (Smith & Carayon-Sainfort, 1989). The work system model includes five elements (i.e., person, task, tools/technology, organization, and environment), which interact to produce outcomes (e.g., worker stress, patient experience). Because the elements of the work system influence each other, the system can be balanced by ensuring that there are more positive outcome interactions than negative (i.e., overall system balance) or that the positive outcome interactions negate or diminish the negative outcomes interactions (i.e., compensatory balance).

The work system model (Smith & Carayon-Sainfort, 1989) was integrated in the Structure element of the Structure, Process, Outcome (SPO) model of Donabedian (1988), creating the Systems Engineering Initiative for Patient Safety (i.e., SEIPS) model (Carayon et al., 2006). The SEIPS model exemplifies how the five interacting elements of the work system affect processes and outcomes, with feedback loops that allow for the work system and process to evolve based on the outcomes.

The SEIPS 2.0 model, developed by Holden et al. (2013), introduced configuration, provided distinction for different types of work in the process element, expanded upon the outcomes, and accounted for adaptation. Work system configuration states that, while all work system elements can interact within a given process, for certain processes, only a subset of interactions are relevant. Within the process element, SEIPS 2.0 distinguishes between patient work, professional work, and collaborative patient-professional work, which influences the possible outcomes. For example, outcomes may be experienced at the individual level (i.e., patient, professional) or at the organizational level (e.g., health system). Lastly, the SEIPS 2.0 model proposes that the work system, process, and outcomes can adapt, highlighting the evolving nature of the work system.

The SEIPS 3.0 model focused on the patient perspective (i.e., patient journey) (Carayon et al., 2020). Because patients receive health care across multiple clinical (e.g., hospital, outpatient clinic) and community (e.g., home) care settings over time (Carayon & Wood, 2010; Vincent & Amalberti, 2016), the process of receiving care from the patient perspective is a journey rather than a single clinical encounter. The patient journey has been defined as the “spatio-temporal distribution of patients’ interactions with multiple care settings over time” (Carayon & Wooldridge, 2019). SEIPS 3.0 describes the patient journey as multiple work systems interacting

temporally resulting in patient outcomes (e.g., patient safety), which feed back into the patient journey.

The SEIPS models can be used to understand complex care processes (Carayon et al., 2014b), such as the emergency department discharge process; more specifically, how the older adult and clinicians perform tasks together, using tools and technologies, within the ED environment during the discharge process and how that feeds forward into the older adult's experience and patient safety outcomes. According to SEIPS 2.0, the older adult-clinician interactions during the discharge process can be conceptualized as collaborative work, i.e., collaboration (Holden et al., 2013).

2.3.3 Defining collaboration

Collaboration (i.e., collaborative work) has been described by three key definitions in the literature, each of which becomes increasingly complex. Table 7 outlines the three definitions, how they were developed, and how they incorporate the key aspects of collaboration.

Table 7. Definitions of collaboration.

Author	Definition	Definition development	Aspects of collaboration
Holden et al. (2013)	"Collaborative work is work in which both professionals and non-professionals (e.g., patients) are actively engaged agents"	Integration in process element of SEIPS 2.0 model	○ ≥2 people ○ Active and reciprocal engagement in joint activities
Patel, Pettitt, & Wilson (2012)	"Collaboration involves two or more people engaged in interaction with each other, within a single episode of series of episodes, working towards a common goal."	Initial concept developed through literature review. Reviewed and iterated through interviews, workshops, expert brainstorming, and elicitation of user requirements through user-based collaborations.	○ ≥2 people ○ Active and reciprocal engagement in joint activities ○ Shared goal
Bedwell et al. (2012)	"Collaboration [is] an evolving process whereby two or more social entities actively engage in	Synthesis of the literature on collaboration from multiple fields (e.g., organizational behavior,	○ Evolving process ○ ≥2 social entities

	joint activities aimed at achieving at least one shared goal."	biology, engineering, healthcare)	○ Active and reciprocal engagement in joint activities ○ Shared goal

The definition of collaboration proposed by Bedwell et al. (2012) is comprised of four key aspects: collaboration is an (1) evolving process, (2) includes two or more social entities, (3) active and reciprocal engagement in joint activities, and (4) has one shared goal.

1. Collaboration is an evolving process where relationships, members, and tasks can change over time. Collaboration as an evolving process is congruent with its position as the process element of the SEIPS model (Carayon et al., 2006; Carayon et al., 2020; Holden et al., 2013). The feedforward and feedback loops between the work system, process, and outcomes provide a mechanism for the evolution of collaboration, especially when considered in the context of the spatio-temporal nature of the patient journey.
2. Collaboration occurs between two or more social entities. Social entities include individuals, teams, units, departments, organizations, and societies. Collaboration can occur among and across social entities.
3. Collaboration requires active and reciprocal engagement in joint activities (i.e., interactions). Collaboration requires active and reciprocal, but not necessarily equal engagement in joint activities; therefore, engagement may be disproportionate between social entities.
4. Lastly, collaboration is work towards at least one mutually agreed upon shared goal. Social entities can also have additional and possibly conflicting goals.

These four key aspects are combined to define collaboration as "an evolving process whereby two or more social entities actively engage in joint activities aimed at achieving at least one shared goal." (Bedwell et al., 2012).

Collaboration, as defined by Bedwell et al. (2012), uniquely applies to the ED discharge process. First, collaboration is an evolving process, during the ED discharge process older adults often see multiple clinicians (e.g., ED physician, ED nurse, ED technician), which may span a shift change, and the discharge instructions or disposition location may change based on new information. Second, collaboration occurs between two social entities, such as the older adult (i.e., individual) and the ED care team (i.e., team). Third, collaboration requires active and reciprocal, but not necessarily equal, engagement in in joint activities. Active and reciprocal engagement in the ED discharge process may include learning, coordinating, communicating, and decision making (see Table 8). Lastly, collaboration is work towards a mutually agreed upon shared goal. During the discharge process, the goal may be helping the patient prepare for a safe care transition between the ED and home.

Collaboration is further defined by the processes that encompass these four key aspects. In an extensive review of the literature, Patel, Pettitt, and Wilson (2012) identified 36 factors and subfactors of collaboration. Organizing these 36 factors and subfactors into the three elements of the SEIPS model (i.e., work system, process, outcomes) (Carayon et al., 2006; Carayon et al., 2020; Holden et al., 2013), there are 29 that relate to work system interactions, 4 factors related to the collaboration (i.e., collaborative interactions) and 3 factors related to outcomes. Table 8 outlines the four collaborative interactions: learning, coordinating, communicating, and decision making, and their defining characteristics.

Table 8. Collaborative interactions.

Collaborative interactions	**Defining characteristics**
Learning (Patel et al., 2012)	Formal and informal learning
Coordinating (Martín-Rodríguez et al., 2005; Patel et al., 2012)	Goal setting, integrating people & information, managing task interdependencies, managing resources, feedback
Communicating (Martín-Rodríguez et al., 2005; Mattessich & Monsey, 1992; Patel et al., 2012)	Knowledge transfer, synchronous/asynchronous (e.g., email), verbal/non-verbal, listening
Decision making (Mattessich & Monsey, 1992; Patel et al., 2012)	Three collaborative steps in shared decision-making process: 1. Information collection 2. Alternative exploration 3. Choice Intuitive & analytic process, participation at each level

The descriptive review by Patel, Pettitt & Wilson (2012) evaluated collaboration from a general perspective, integrating conceptualizations of collaboration from multiple different domains. Therefore, there is a need to understand collaboration in the health care context, specifically the older adult – clinician collaboration that occurs during the ED discharge process. Through the lens of the SEIPS model (Carayon et al., 2006; Carayon et al., 2020; Holden et al., 2013), collaboration can be conceptualized as a process, which is embedded within the work system. Integrating collaboration into the SEIPS model will allow for a health care focused approach to understanding collaboration as a process embedded within the work system; for example, the barriers and facilitators that affect collaboration.

2.3.4 Distinction between collaboration, coordination, and teamwork

Collaboration, as defined by Bedwell et al. (2012), shares similar aspects to coordination but is distinctly different than coordination. Schultz and McDonald (2014) define care coordination as

"the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient's care to facilitate the appropriate delivery of care services. Organizing care involves the marshalling of personnel and other resources needed to carry out all required patient care activities and is often managed by the exchange of information among participants responsible for different aspects of care." The definition of care coordination has five key aspects:

1. at least two participants,
2. interdependencies,
3. roles and resources,
4. information exchange, and
5. articulation of a goal (Schultz & McDonald, 2014).

Based on this definition of care coordination, the distinguishing factor between care coordination and collaboration is that care coordination requires interdependencies. The findings from an empirical study on care coordination for chronically ill patients confirm that care coordination happens in a team and requires coordination activities (i.e., communication, relationship building, monitoring) and interdependencies (e.g., pre-requisite, shared resources, simultaneity) (Kianfar et al., 2019; Kianfar et al., 2014). Conversely, collaboration does not require interdependencies but rather the joint and reciprocal engagement in activities. Further, some coordination activities, such as communication, are also collaborative because they have the four key aspects of collaboration (i.e., evolving process, ≥2 social entities, active and reciprocal engagement in joint activities, shared goal). But other coordination activities are not collaborative because they do not have all four key aspects of collaboration. For example, monitoring (Kianfar et al., 2019; Kianfar et al., 2014) is a coordination activity but not

collaboration because monitoring does not require active and reciprocal engagement in joint activities. While some collaboration involves coordination, collaboration and coordination are distinguished by interdependencies and the requirement for active and reciprocal engagement in joint activities.

Collaboration and teamwork are also conceptually similar constructs. The primary distinctions between collaboration and teamwork are found in the defining characteristics and at the level of analysis. Teamwork has been defined as "the process through which team members collaborate to achieve task goals" (Driskell et al., 2018) and is comprised of three characteristics: (1) communication, (2) coordination, (3) and cooperation (Salas et al., 2008). Both communication and coordination are similar characteristics between collaboration and teamwork, yet, teamwork includes cooperation, whereas collaboration does not. In teamwork, cooperation is an outcome of the team process. For example, cooperation is described as the motivation to maintain the team, trust, and cohesion (Salas et al., 2008). While cooperation may occur during collaboration, it is not required, especially since collaboration can occur between social entities that do not identify as a team. Secondly, teamwork involves interactions at the individual or team level and has been traditionally conceptualized as happening among professionals (Xyrichis & Ream, 2008), whereas collaboration can involve interactions at the individual, team, organization, or societal level, with the resulting distinction being the level of analysis (Bedwell et al., 2012). In conclusion, distinguishing collaboration and teamwork is challenging and the two concepts are often used interchangeably in the literature. Yet, for the purpose of this research, I use the concept of collaboration, as defined by Bedwell et al. (2012) because it includes parts of coordination and teamwork but also extends beyond their definitions to include decision making and learning.

2.4 Summary of literature review

In this review, I have presented a summary on previous work on the ED discharge process and outlined gaps in the literature. I concluded that the current work on the ED discharge process does not use a systems approach, does not include the collaboration performed by older adults and clinician, and does not integrate multiple perspectives. Given these gaps in the ED discharge literature, I outlined why a systems approach (i.e., SEIPS) is necessary to understand how older adults and ED clinicians collaborate during the ED discharge process.

Chapter 3: Research Questions

As discussed in Chapter 2, a multitude of studies have designed interventions to improve the discharge process, yet they often present mixed results on improving patient safety outcomes and patient experience. This may result from an insufficient understanding of the ED discharge process. Further, despite the influence of the older adult – clinician relationship on older adult's patient safety and experience, few studies on the ED discharge process consider how the older adults and ED clinicians engage in collaboration. Therefore, I used the SEIPS model and the concept of collaboration to study the ED discharge process.

Figure 1 is an adapted version of the SEIPS model that depicts how older adult and ED clinician collaboration occurs during the ED discharge process. During the discharge process, older adults and ED clinicians perform tasks, using tools and technology, within the physical and organizational environment of the ED. These work system interactions feed forward into the collaborative process, which includes collaborative interactions: learning, coordinating, communicating, and decision making (Patel et al., 2012). The collaborative interactions then feed into patient experience in the ED and patient safety outcomes.

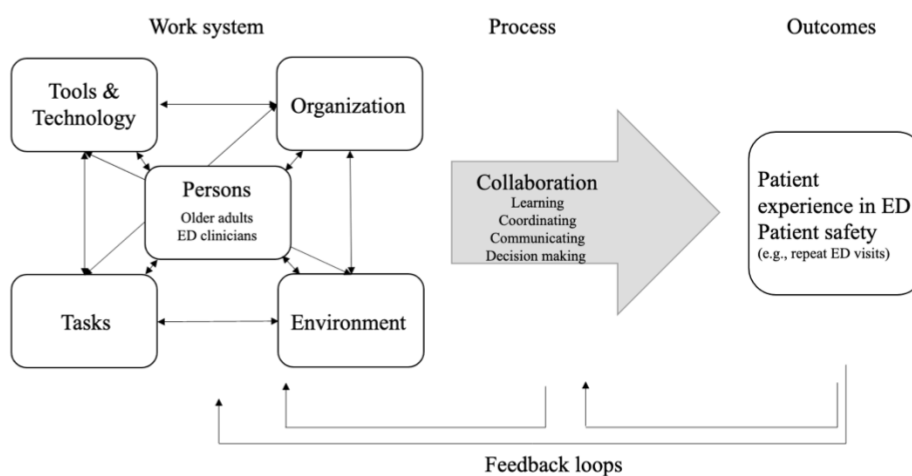

Figure 1. Adapted SEIPS model of older adult and clinician collaboration in the ED.

3.1 Research Question 1

RQ1: What activities compose the ED discharge process and how does collaboration occur between older adults and ED clinicians during the ED discharge process?

As discussed in Chapter 2, collaboration is “an evolving process whereby two or more social entities actively engage in joint activities aimed at achieving at least one shared goal.” (Bedwell et al., 2012). Further, collaboration includes four types of interactions: learning, coordinating, communicating, and decision making (see Table 8). Understanding collaborative interactions that occur between older adults and ED clinicians during the ED discharge process may help to improve older adults experience and patient safety outcomes. Hence, I explored the research question: What activities compose the ED discharge process and how does collaboration occur between older adults and ED clinicians during the ED discharge process?

3.2 Research Question 2

RQ2A: How do work system barriers and facilitators affect older adult and ED nurse collaboration during the operational discharge process?

RQ2B: How do the barriers and facilitators experienced by older adults and ED nurses to collaboration during the operational discharge process compare?

As reviewed in Chapter 2, none of the studies on ED discharge interventions performed a systematic analysis of work system barriers and facilitators to the ED discharge process. Hence, I explored the research question: How do work system barriers and facilitators affect older adult and ED nurse collaboration during the ED discharge process?

Only a few studies have looked at health care work processes that involve multiple perspectives using a SEIPS-based approach (Kelly et al., 2019; Montague & Kleiner, 2009; Musuuza et al.,

2019; Schultz et al., 2007; Werner et al., 2021). Kelly et al. (2019) evaluated the use of a family centered rounds checklist in a pediatric hospital through work system barriers and facilitators identified by senior residents and attending physicians. Montague and Kleiner (2009) identified mismatches in roles expectations during patient-physician interactions in the obstetrics unit of a hospital. Musuuza and colleagues (2019) identified common, unique, and conflicting work system barriers and facilitators to implementing a *C. difficile* prevention bundle in a hospital from the perspectives of nurses, physicians, and environmental service personnel. Schultz and colleagues (2007) collected data from the patient (i.e., patient shadowing) and clinician perspective (i.e., clinician shadowing and feedback and clinic shadowing) to identify facilitators, obstacles, and consequences to information flow in the outpatient, preoperative process. Werner et al. (2021) found that skilled nursing facility (SNF) and ED clinicians had misaligned mental models of the ED to SNF care transition process, resulting in different perceptions of the process. While these studies have explored multiple perspectives (e.g., patients, clinicians, environmental services personnel) in different contexts (e.g., hospital, outpatient surgery, obstetrics unit), none of them have studied older adult and ED nurse perspectives of barriers and facilitators to collaboration during the ED discharge process. Further, none of the studies have compared the patient (i.e., older adult) and clinician perspectives of the perceived barriers and facilitators. Therefore, I explored the research question: How do the barriers and facilitators experienced by older adults and ED nurses to collaboration during the operational discharge process compare?

Chapter 4: Methods

In this chapter, I outline my research approach and how the proposed methods help to answer my research questions. Further details of my methods are included in chapters 5 and 6. I used the three-component framework proposed by Creswell & Creswell (2018), as displayed in Figure c. The remainder of the chapter is as follows:

1. Presentation of my philosophical worldview,
2. Overview of the AHRQ Patient Safety Learning Lab (PSLL) project
3. Study design, and
4. Research methods.

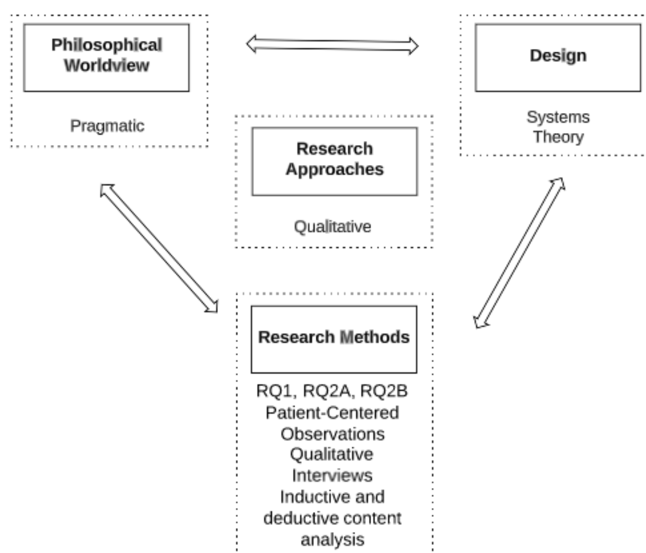

Figure 2. A framework for research – The interconnection of worldviews, design, and research methods adapted from Creswell & Creswell (2018).

4.1 Researcher's Worldview

A researcher's philosophical worldview influences the practice of research and guides a researcher in making decisions on research approach, design, and methods (Creswell &

Creswell, 2018). My philosophical worldview is pragmatic, emphasizing practical empiricism, practical theory (i.e., concern with application and solutions to problems), and use of all available approaches to problem understanding (Creswell & Creswell, 2018; Robson & McCartan, 2011). Further, pragmatism recognizes plurality, which allows for acknowledgement of different and conflicting perspectives (Robson & McCartan, 2011). Lastly, pragmatism views knowledge as both constructed by and based in the world we live in (Creswell & Creswell, 2018; Robson & McCartan, 2011) and therefore, situated within context (e.g., social context, political context). My pragmatic research approach was guided the following study design and research methods.

4.2 Overview of AHRQ Patient Safety Learning Lab (PSLL) Project

This study was conducted at the University of Wisconsin-Madison as part of an Agency for Healthcare Research and Quality (AHRQ) Patient Safety Learning Lab (PSLL) project titled "Engineering Safe Care Journeys for Vulnerable Older Adults" (https://cqpi.wisc.edu/research/health-care-and-patient-safety-seips/patient-safety-learning-lab-psll/). The study was conducted at the BerbeeWalsh Department of Emergency Medicine at the University of Wisconsin Hospital and Clinics. The ED at the University of Wisconsin Hospital is part of a large, academic, American College of Surgeons Level 1 trauma center and has nearly 50 faculty, 58 beds, and treats roughly 63,000 patients per year (approximately 200 patients per day). Our study focused on designing a system of care that aids older adults who present to the ED after experiencing a fall transition to their next care setting (e.g., home, hospital, skilled nursing facility (SNF)) by using a systems approach, i.e., SEIPS 3.0 model (Carayon et al., 2020), and a transdisciplinary team (e.g., engineers, physicians, nurses, patients).

The activities conducted during the five-year project were divided into the AHRQ RFA Five-Step Methodology: (1) problem analysis, (2) design, (3) development, (4) implementation, and (5) evaluation (figure 3).

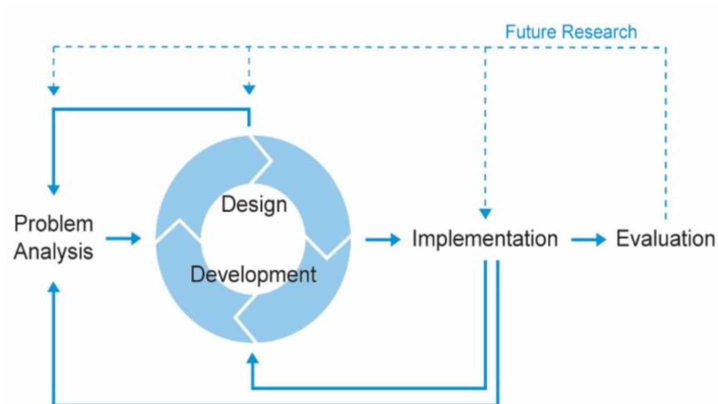

Figure 3. Five-step methodology (per AHRQ RFA).

The initial problem analysis phase consisted of a work system analysis, guided by the SEIPS model (Carayon et al., 2006; Carayon et al., 2020; Holden et al., 2013), including ED, hospital, and SNF clinician interviews and patient-centered observation. The work system analysis then informed the design and development phases. During design and development, the research team created two working groups; working group 1 (WG1), which focused on the ED to SNF care transition, and working group 3 (WG3), which focused on the ED to home care transition. WG1 and WG3 interventions were implemented and evaluated.

WG3 intervention design and evaluation

The WG3 intervention design and implementation occurred over 5 core meetings and 25 supplemental meetings with a transdisciplinary team (e.g., HFE, ED clinicians, health IT, community members, patients, care partners). The intervention consisted of four components: (1)

EHR template for physician instructions, (2) redesigned after visit summary (AVS), (3) reminder about teach back, and (4) redesigned follow-up call. The components of the WG3 intervention were evaluated using multiple qualitative and quantitative methods (e.g., patient interviews and survey, ED nurse interviews, ED physician survey, EHR data). Table 9 outlines the five components of the WG3 interventions and provides a detailed description of each component and how they were evaluated. Figure 4 outlines how the components of the WG3 intervention affected the ED discharge process. The intervention was implemented on May 4th, 2021.

Table 9. WG3 intervention component explanation and methods of evaluation.

No.	WG3 intervention component	Description	Methods for evaluation
1	EHR template for physician instructions	Dot phrase template in EHR for ED physicians to enter discharge instructions into AVS. Integrates Coleman et al. (2006) four pillars of care transitions: medication self-management, home care, follow-up, and red flags.	EHR data on use of template Survey of ED physicians
2	Redesigned after visit summary (AVS)	Redesigned AVS through staged heuristic evaluation (Barton et al., 2022), feedback from WG3 meeting, meeting with community members, and patient and care partner focus groups	Older adult interviews and survey ED nurse interviews
3	Teach back	Integration of teach back method during patient and ED nurse conversation during discharge process. Teach back education distributed to ED nurses.	Older adult interviews and survey ED nurse interviews
4	Redesigned follow-up call	EHR-based guide for ED RN to follow when conducting post-discharge follow-up call with patient. Integrates Coleman et al. (2006) four pillars of care transitions: medication self-management, home care, follow-up, and red flags.	Older adult interviews and survey ED nurse interviews

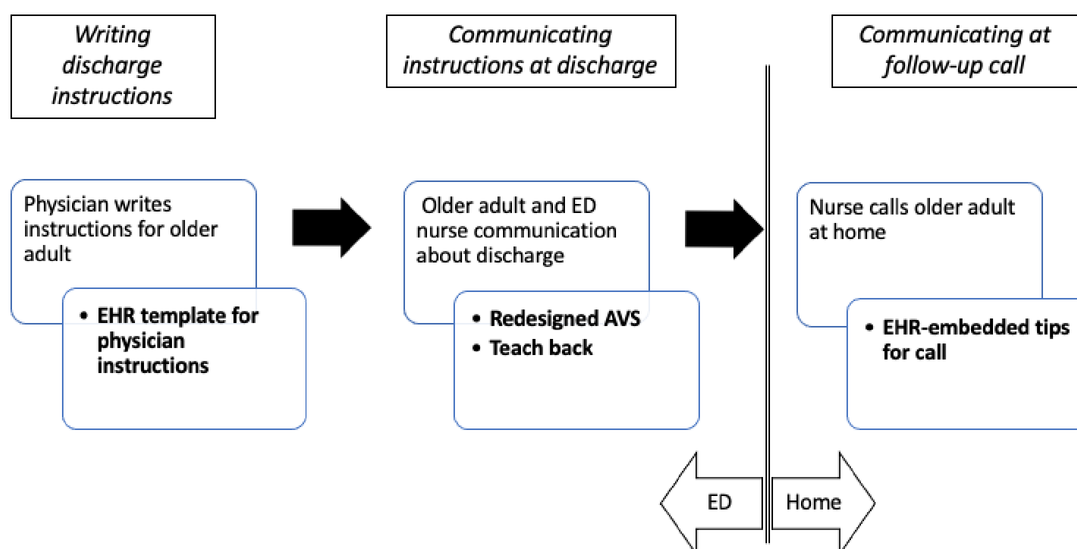

Figure 4. WG3 interventions within the ED discharge process.

My research focused on PSLL data collected during two phases of the AHRQ-RFA Five-Step Methodology: the problem analysis phase and the evaluation phase of the WG3 intervention. Specifically, I used the ED nurse interviews and patient-centered observation data from the problem analysis phase and the older adult and ED nurse interviews from the WG3 evaluation phase.

4.3 Overall study design

My research investigated the older adult and ED clinician collaboration during the ED discharge process. Integrating my pragmatic worldview, I did this using a variety of data sources and data analysis methods, see Table 10. I used the patient observation data and ED clinician interviews from the PSLL project problem analysis phase to answer research question 1. For research question 2, I used the older adult and ED nurse interviews collected during the evaluation phase for the WG3 intervention.

Table 10. Research questions and corresponding methods.

Research question	Data collection	Data analysis
RQ1: What activities compose the ED discharge process and how does collaboration occur between older adults and ED clinicians during the ED discharge process?	• Initial ED clinician interviews • Patient-centered contextual inquiry	Secondary inductive content analysis using collaborative interactions (Table 8)
RQ2A: How do work system barriers and facilitators affect older adult and ED nurse collaboration during the operational discharge process?	• WG3 older adult interviews • WG3 ED nurse interviews	Secondary staged deductive and inductive content analysis of work system barriers and facilitators
RQ2B: How do the barriers and facilitators experienced by older adults and ED nurses to collaboration during the operational discharge process compare?	• WG3 older adult interviews • WG3 ED nurse interviews	Comparison of identified work system barriers and facilitators

Secondary qualitative data analysis

Secondary qualitative data analysis has been defined as "the use of an existing data set to find answers to a research question that differs from the question asked in the original or primary study" (Hinds et al., 1977). Beck (2019) identified three typologies for secondary qualitative data analysis: (1) Thorne's (2013), (2) Hinds et al. (1977), and (3) Heaton (2008); see appendix A for a description of each typology. For the purpose of this study, I am using analytic expansion as defined by Thorne (2013), which involves a secondary analysis of an original data set to ask new questions that had not been considered at the start of the study. This approach is similar to the third approach described by Hinds (1977) and supplementary analysis as defined by Heaton

(2008), where an in-depth data analysis of data from the primary study is examined with respect to a new concept or emergent issue.

There are many advantages to performing a qualitative secondary analysis. For example, the researcher can generate new knowledge and maximize output while minimizing administrative and implementation costs of data collection (Ruggiano & Perry, 2019). Further, secondary analysis can help to minimize burden on research participants and community stakeholders (Beck, 2019; Ruggiano & Perry, 2019). Additionally, secondary analysis provides an opportunity to analyze concepts and theories that may be challenging to collect primary data on and can promote generalizability of results (Beck, 2019). Lastly, secondary analysis aligns with the pragmatic approach and makes use of data that have already been collected.

Despite the benefits, there are methodological and ethical challenges to performing secondary qualitative data analysis. Methodological challenges include the degree of fit between the primary data collection methods and the research questions posed in the secondary analysis (e.g., there may be missing data), and the extent to which the primary and secondary research questions are different (Hinds et al., 1977). Ethical concerns include issues of informed consent, sensitivity towards the primary context of the study with respect to socio-cultural-political norms, and timing of the secondary analysis (Hinds et al., 1977; Ruggiano & Perry, 2019). Despite the challenges, secondary analysis can be an effective means for knowledge generation that benefits society.

In my study, I conducted a secondary qualitative data analysis of four data sources as described in Table 10. Information on the sample, recruitment, data collection, and data analysis can be found in chapters 5 and 6, for research questions 1 and 2, respectively. Additional information on

the data analysis process for research questions 1 can be found in appendix F and for research question 2 in appendix G.

Chapter 5: Collaboration During the Emergency Department Discharge Process

This chapter is presented in the format of a manuscript prepared for Academic Emergency Medicine.

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Running head: Collaboration during ED discharge

Manuscript type: research article

Word count of text:

Acknowledgments

This research was supported by grant 5R18HS026624 from the Agency for Healthcare Research and Quality, grant UL1TR002373 from the Clinical and Translational Science Award (CTSA) program, through the NIH National Center for Advancing Translational Sciences (NCATS), and grant K24AG054560 from the National Institute on Aging. The project was also supported by

the University of Wisconsin School of Medicine and Public Health through Wisconsin Partnership Program funding to the Wisconsin Institute for Healthcare Systems Engineering and the Health Innovation Program. The content is solely the responsibility of the authors and does not necessarily represent the official views of AHRQ or the NIH. Corresponding author is Kathryn Wust (wust@wisc.edu).

5.1 Abstract

Objective

To describe in detail the ED discharge process including the collaboration that occurs between older adults and clinicians.

Background

An older adult's care transition out of the ED, i.e., the discharge process, is high risk and may contribute to poor patient safety and negative patient experience. Many studies have designed interventions to improve the discharge process but have reported mixed results on improving patient safety or experience outcomes, which may be due to their lack of understanding of the activities that occur during the discharge process. Human Factors Engineering methods, such as a systems approach and process mapping, are a way to gain a deep understanding of the process and how older adults and ED clinicians interact, i.e., collaborate, during ED discharge.

Methods

We analyzed our data in two phases integrating two data sources: (1) 7 patient-centered observations of older adults (≥ 65 year old) who presented to the ED after having fallen and (2)

7 interviews with ED physicians and nurses. We used structural coding of the patient-centered observations and ED physician and nurse interviews to extract large segments from the data corpus related to the ED discharge process. We used an inductive and a deductive content analysis of the excerpts to identify and define the discharge activities and the patient-clinician collaboration as it occurs during the ED discharge process.

Results

We identified 14 activities that constitute the ED discharge process. Ten of these activities are distributed throughout the ED stay, are not temporally bound, and may repeat, whereas four of these activities are temporally bound and occur at the end of the older adults ED visit (i.e., operational discharge). We identified older adult and ED clinician collaboration, including learning, coordinating, and communicating, in seven of the discharge activities.

Conclusion

Interventions designed to improve the ED discharge process need to account for the activities that occur in the process, how those activities are distributed, who is involved, and how they collaborate to positively affect patient safety and experience outcomes.

Keywords: ED discharge process, collaboration, Human Factors Engineering, process map

5.2 Introduction

Older adults in the Emergency Department (ED).

Older adults in the U.S. presented to the ED over 26 million times in 2020, representing over 20% of all ED visits (Cairns & Kang, 2020). While in the ED, older adults may have negative patient experiences. For example, some older adults report experiencing ageism and poor communication with ED clinicians while in the ED (Goodridge et al., 2018; Kolk et al., 2021). In addition, older adults often have poor patient safety outcomes (e.g., functional decline, unplanned hospitalization, and repeat ED visits) after being in the ED (Aminzadeh & Dalziel, 2002; Gabayan et al., 2013; Schnitker et al., 2011; Stiell et al., 2003). An important component of an older adult's visit to the ED is their care transition between the ED and home, i.e., the discharge process.

The discharge process for older adults in the ED.

The discharge process occurs near the end of the older adult's ED visit and often includes sharing of information (e.g., discharge instructions) and education with an ED clinician about the ED visit and how the older adult should care for themselves at home (Boonyasai et al., 2014). The discharge process is considered a high-risk care process that requires effective information, authority, and responsibility transfer (Carayon & Wood, 2010). Studies have identified many challenges during the ED discharge process: (1) insufficient length of the process (Rhodes et al., 2004; Vashi & Rhodes, 2011), (2) inadequate information provided by clinicians (Palonen et al., 2015; Vashi & Rhodes, 2011), (3) patients not consistently receiving discharge instructions (Taylor & Cameron, 2000b), and (4) patients lacking comprehension of discharge instructions (Clarke et al., 2005; Hastings et al., 2011; Sheikh et al., 2018). Further, research has found that inadequate instructions and ineffective communication during the discharge process negatively

affect older adults' experience in the ED and may contribute to poor patient safety outcomes (e.g., return visits to the ED) (Goodridge et al., 2018; Kolk et al., 2021). Systematic reviews by Hughes et al. (2019) and Preston et al. (2021) found that interventions aimed at improving older adults' care transitions between the ED and the next care setting, i.e., the discharge process, are associated with improved patient safety and experience outcomes.

Interventions designed to improve the discharge process.

Multiple literature reviews have focused on synthesizing interventions designed to improve older adult care transitions out of the ED (Gettel et al., 2021, Hasting et al., 2008, Lowthian et al., 2015). These interventions include screening tools (e.g., Identification of Seniors at Risk (ISAR), care coordination, geriatric assessment, discharge planning, follow-up (e.g., in-person, telephone), ED nurse education, and home/community-based services (e.g., rapid referral/liaison for PCP, home health services) (Gettel et al., 2021, Hasting et al., 2008, Lowthian et al., 2015). Despite the diversity and reach of these interventions, studies report mixed results on improving patient safety and patient experience (Gettel et al., 2021, Hasting et al., 2008). Further, in a meta-synthesis, Lowthian et al. (2015) found no effectiveness of the interventions on reducing repeat ED visits or hospitalization and minimal effect on functional status and nursing home admission.

To our knowledge, none of the care transition intervention studies included in these systematic reviews used a systems approach to deeply understand the discharge process before designing and implementing the interventions. This may limit the ability of these interventions to improve patient safety or patient experience because there was no prior understanding of how the interventions would integrate into the discharge process. Further, the interventions may not have been designed for all the roles involved (e.g., ED physician, ED nurse, older adult) and how

these roles collaborate during the discharge process. Therefore, to design more effective interventions, we need a deeper understanding of what occurs during the discharge process, the roles involved, and how the different roles interact and collaborate.

HFE methods can be used to describe the ED discharge process and collaboration.

Human Factors Engineering (HFE) methods have shown utility in addressing health care complexity through the application of tools and techniques aimed at analyzing complex processes and designing interventions (Carayon et al., 2014b; Carayon et al., 2021). One such tool is process modeling, which provides a diagrammatic description of activities involved in a process, the sequence of activities, and key stakeholders (Jun et al., 2009). Wooldridge et al. (2017) developed the SEIPS-based process modeling method, integrating process modeling techniques with the SEIPS model (Carayon et al., 2006; Carayon et al., 2020; Holden et al., 2013). SEIPS-based process modeling visually describes how work system elements (i.e., person, task, tools/technology, organization, environment) interact during a complex health care process. Further, an HFE-based systems approach, such as SEIPS, allows for an understanding of how people interact within the process, i.e., how they collaborate. Therefore, an HFE-based approach that combines the SEIPS-based process modeling method and the concept of collaboration can facilitate a deeper understanding of what occurs during the discharge process in the ED, including how older adults and ED clinicians engage in collaboration.

5.3 Research objective

To describe in detail the ED discharge process, including the collaboration between older adults and ED clinicians.

5.4 Methods

This study was conducted as part of a larger project on the care journeys of older adults who present to the ED after having experienced a fall (https://cqpi.wisc.edu/research/health-care-and-patient-safety-seips/patient-safety-learning-lab-psll/). We collected data in the ED of a US academic medical center from December 2018 to December 2019. This research complied with the American Psychological Association Code of Ethics and was approved by the Institutional Review Board at the University of Wisconsin-Madison.

To address the study objective, we used two sets of data: (1) patient-centered observations and (2) interviews of ED physicians and nurses and conducted a secondary qualitative data analysis.

5.4.1 Patient-centered observations

Sample

The sample consisted of 7 older adults (female = 5, age range = late 60s-80s). Four of the older adults were accompanied by a care partner(s) and two presented to the ED alone. Care partners included adult children (daughters = 3, sons = 2) and spouse (wife = 1). Older adults arrived at the ED via ambulance (n = 3) or car (n = 4) from their home (n = 6) or another hospital (n = 1). After their ED visit, older adults were discharged home.

Recruitment and data collection

Two HFE researchers conducted 7 patient-centered observations with the 7 participating older adults and their care partners. Older adults must have presented to the ED for a primary complaint of fall occurring within the previous 48 hours; been aged 65 years or older; not be categorized as a Level One trauma; and if they had an activated power of attorney (POA), the

POA was present at the time of the ED visit. If present, the older adults care partner(s) were also recruited to participate.

The HFE researchers collaborated with ED research coordinators (EDRC) to recruit participants. When the HFE researchers were present in the ED, the EDRC would monitor a track-board within the electronic health record (EHR) for potential participants. After identifying a potential participant, the EDRC would approach the ED clinician caring for the older adult to discuss whether the older adult was appropriate to approach for inclusion in the study. Upon approval from the ED clinicians, the EDRC would approach the older adult and their care partner, inform them of the study, and ask them to participate. If they agreed to participate, the EDRC obtained consent. The EDRC introduced the older adult and care partner to the HFE researcher, at which point the observation began. Over the course of the older adult's ED visit, the HFE researcher observed the interactions among the older adult, care partner, and clinicians, taking detailed notes on a structured observation form. The structured observation form was based on the SEIPS model (Carayon et al., 2006; Carayon et al., 2020; Holden et al., 2013), which guided the HFE researcher in recording who (i.e., person) was doing what (i.e., task), using which tools and technologies within the physical and organizational environment, see appendix C. The observations concluded after discharge when the older adult left the ED to go home.

We collected observation data during the week over several clinical shifts, with data collection starting as early as 8:49 AM and ending as late at 11:10 PM. The observations ranged between 2 to 7.5 hours (average = 4.6 hours), which resulted in over 33 hours of observation and yielded 64 pages of typed observation notes.

5.4.2 ED physician and nurse interviews

Sample

The sample consisted of 4 ED physicians (female = 1) and 3 ED nurses (female = 3). ED physician tenure at the study ED ranged from 3.5 to 13 years and the ED nurse tenure ranged from >1 to 5 years.

Recruitment and data collection

Four HFE researchers conducted 7 semi-structured interviews with ED physicians and nurses. ED physicians were recruited to participate because they served on the study team. ED nurses were recruited by the ED physicians to participate. During the interview, two HFE researchers asked the ED physicians and nurses questions from a semi-structured interview guide. The interview guide included questions about older adult's care transitions (e.g., ED to home) and the processes that compose the transition (e.g., disposition decision making, discharge process). The questions were informed by the SEIPS model (Carayon et al., 2006; Carayon et al., 2020; Holden et al., 2013) and addressed who was doing what with what tools and technologies in a specific physical and organizational environment, see appendix B.

The interviews lasted an average of 54 minutes (range = 35-82 minutes, total = 376 minutes) and were held in a mutually agreed upon private meeting room. The interviews were audio recoded and professionally transcribed.

5.4.3 Data analysis

We conducted a secondary qualitative data analysis (Beck, 2019) in two phases. In the first phase, we used structural coding of the patient-centered observations and ED physician and nurse interviews to extract large segments from the data corpus related to the ED discharge

process (Saldaña, 2016). During the second phase, we conducted a staged inductive and deductive content analysis (Elo & Kyngas, 2008). We performed an inductive content analysis of the excerpts to identify and define discharge activities and a deductive analysis of the patient-clinician collaboration that occurs during the discharge activities. Throughout both phases of data analysis, we iteratively reviewed the coding and codebook and refined, added, removed, and combined codes.

Phase 1

In phase 1, we used structural coding (Saldaña, 2016) to extract large segments from the 7 patient-centered observations and 7 ED physician and nurse interviews related to the ED discharge process. We conducted the data segmentation using definitions informed by the literature on discharge, including the three characteristics of a high-quality discharge process as defined in the AHRQ report by Boonyasai et al.(2014); discharge instructions (Taylor & Cameron, 2000a); and operational discharge. Operational discharge was defined as the period occurring after the disposition decision is made and before the older adult leaves the ED when the ED clinicians prepare the discharge instructions, and the ED nurse gives the older adult their discharge instructions and has the discharge conversation. The discharge conversation may include conversation about medication and medication management, follow-up with primary care physician or specialist, reasons to return to the ED, and discussion of home care (Coleman et al., 2006; Coleman et al., 2004).

We performed phase 1 of the data analysis in Dedoose (v.9.0.8). Once we coded all 14 data sources (7 patient-centered observations and 7 ED clinician interviews) we exported the excerpts to Microsoft Excel.

Phase 2

In phase 2, we inductively analyzed the extracted excerpts to identify and define components of the discharge process, i.e., discharge activities. The first author coded one patient-centered observation and one ED nurse interview for discharge activities, which were then reviewed and discussed with a second researcher to develop the discharge activity codes and definitions. We documented these codes and definitions in a codebook and used the codes to analyze the remaining data, see appendix F. Each extracted excerpt was coded for one discharge activity; if we identified an excerpt that described multiple discharge activities, the excerpt was split.

Further, in light of the SEIPS 2.0 model (Holden et al., 2013), we coded each excerpt for patient work, ED clinician work, or collaboration. Collaboration was defined as "an evolving process whereby two or more social entities actively engage in joint activities aimed at achieving at least one shared goal." (Bedwell et al., 2012). Then, we deductively analyzed the excerpts coded as collaboration for the four collaborative interactions described by Patel, Pettitt, and Wilson (2012): (1) learning, (2) coordinating, (3) communicating, and (4) decision making.

After all the excerpts had been analyzed, we mapped the inductively identified discharge activities onto a process map, including whether collaboration, patient work, or ED clinician work occurred during the discharge activity. Two ED physicians and the research team reviewed the process map, and their feedback was incorporated in the final revision.

5.5 Results

5.5.1 The discharge process

We identified 14 activities in the ED discharge process from the 87 excerpts extracted from the 7 patient-centered observations and the 7 interviews with ED physicians and nurses. Figure 5

depicts how the discharge process is distributed throughout the older adult's ED visit and how collaboration, patient work, and ED clinician work occur within the process. See Table 11 for the definitions and examples of the discharge activities.

As shown in Figure 5, the discharge process starts when the patient has been deemed medically appropriate to discharge from the ED and ends when the patient leaves the ED. Within the discharge process, activities occur outside of and within the operational discharge (denoted by a dashed box in Figure 5). Discharge activities outside of the operational discharge do no occur sequentially and may repeat; this is why they are not connected by arrows and are spaced evenly around and to the left of the operational discharge. For example, in one patient-centered observation, the ED physician spoke with the patient and their care partner about being discharged home; this occurred on two separate occasions during the discharge process.

In the discharge process map, the non-operational discharge activities are combined logically in five groupings, based on the ***type of work*** (i.e., collaboration, patient work, clinician work) being completed and by ***the information being discussed*** during the interaction.

- Group 1: The first grouping includes three discharge activities that are instances of ***collaboration*** between the older adult and an ED clinician (i.e., ED physician/APP, specialist physician/APP, or ED nurse) ***discussing being discharged home***.
- Group 2: The second grouping includes 2 discharge activities that are instances of ***collaboration*** between the older adult and the ED nurse or social worker ***discussing community resources and transportation.***

- Group 3: The third grouping includes three discharge activities that are instances of ***clinician work*** where ED care team members, specialist physicians, and PCP/specialist are ***communicating and coordinating patient discharge and follow-up care***.
- Group 4: The fourth group includes one discharge activity that is an instance of ***patient work*** where the older adult and their care partners are ***planning to care for the patient at home***.
- Group 5: The fifth group includes one discharge activity that can either be an instance of ***collaboration or clinician work*** and includes the older adult and/or the ED care team ***preparing the patient for discharge***.

The activities that occur during the operational discharge have temporal dependencies (i.e., are sequential); therefore, they are connected by arrows, see Figure 5. The two activities, "ED nurse augments ED physician discharge instructions" and "ED nurse documents discharge process in EHR", are stacked on top of one another because they often co-occur.

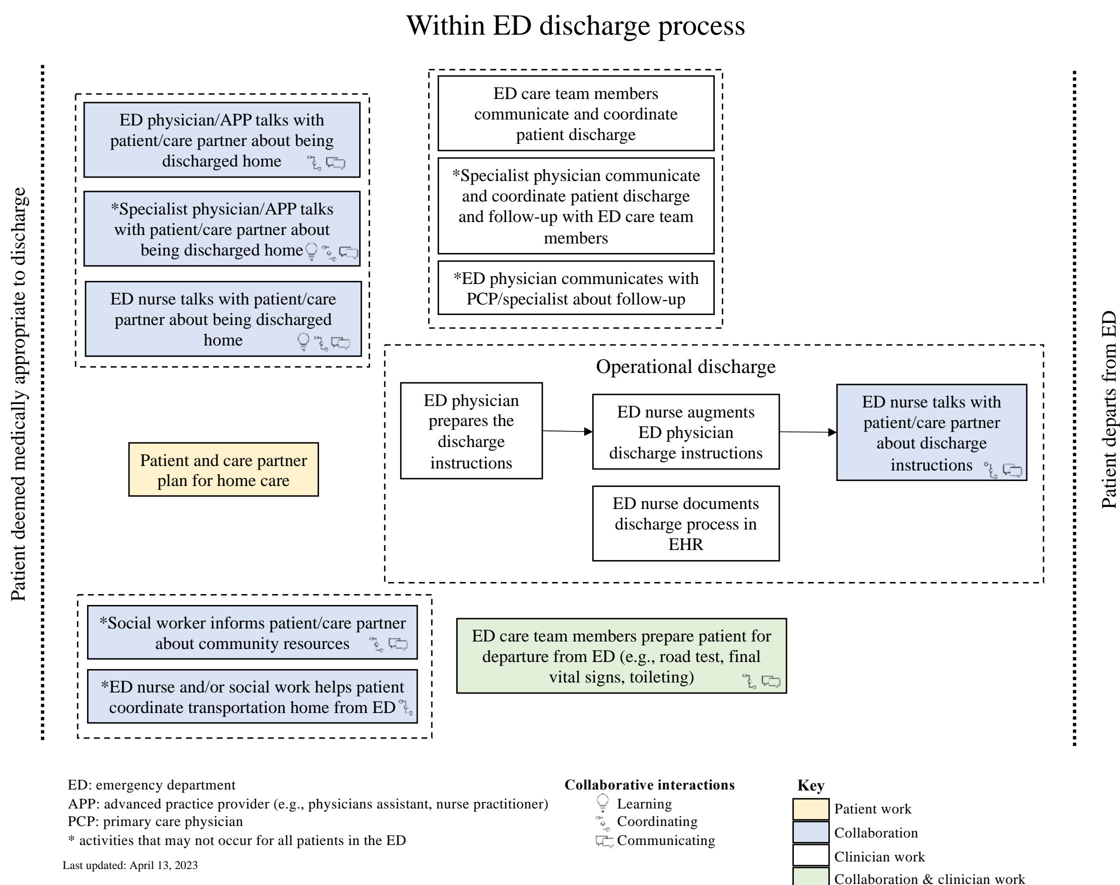

Figure 5. Within ED discharge process.

Table 11. Discharge activities, definitions, and examples.

No.	Activities in the discharge process	Definition
1	Patient and care partner plan for home care	When patients and care partners start to plan for how to care for the patient after discharged from the ED, including: • Who will care for patient at home (family, friends, nurse), • How to care for the patient at home (e.g., toileting, medications), • What assistive/medical devices the patient will need at home • Follow-up care (e.g., notifying PCP patient was seen in ED, scheduling follow-up appointments with PCP/specialists)
2	ED physician/ APP talks with patient/care partner about being discharged home	When an ED resident or attending explains that the patient will be discharged home and talks with the patient and care partner about : • Description of patient's diagnosis (e.g., result of scans, tests) • How to care for patient at home (e.g., wound care, monitoring vitals) • How to seek follow-up care (e.g., visit PCP or specialist) • Medication management (e.g., where to pick up medications, how to take mediations) • Red flags (e.g., when to return to the ED)
3	Specialist physician/APP talks with patient/care partner about being discharged home	When a specialist physician (e.g., orthopedic surgery resident, surgery fellow) explains that the patient will be discharged home and talks with the patient and care partner about: • Description of patient's diagnosis (e.g., results of scans, tests) • How to care for patient at home (e.g., wound care, monitoring vitals) • How to seek follow-up care (e.g., visit PCP, specialist, or physical therapist) • Medication management (e.g., where to pick up medications, how to take mediations) • Red flags (e.g., when to return to the ED)
4	ED nurse talks with patient/care partner about being discharged home	When an ED nurse explains that the patient will be discharged home and talks with the patient and care partner about: • Description of patient's diagnosis (e.g., results of scans, tests) • How to care for patient at home (e.g., wound care, monitoring vitals) • How to seek follow-up care (e.g., visit PCP, specialist, or physical therapist) • Medication management (e.g., where to pick up medications, how to take mediations, helping patient navigate to ED/hospital pharmacy) • Red flags (e.g., when to return to the ED)
5	Social worker informs patient/care partner about community resources	Involvement of social worker in discharge process by providing information or discussing community resources with patient and care partner.

6	ED nurse and/or social worker helps patient coordinate transportation home from ED	When the ED nurse or social worker helps patient coordinate public (e.g., taxi, bus) or private (e.g., care partner) transportation home from the ED.
7	ED care team members prepare patient for departure from ED	Activities performed in the ED to prepare patient to depart, including: • Gather patient's personal affects • Helping patient dress • Removing IV, pulse/oxygen monitor, etc. • Bringing in wheelchair, providing wayfinding directions to help patient exit ED • Helping patient perform oral challenge, road test, and toileting.
8	ED care team members communicate and coordinate patient discharge	Activities performed by the ED care team to coordinate the patient's discharge from the ED.
9	Specialist physician communicates and coordinates patient discharge and follow-up with ED care team members	Activities performed by the specialist physician to coordinate the patient's discharge with the ED care team.
10	ED physician communicates with PCP/specialist about follow-up	Communication by the ED physicians with the patient's PCP or specialists about post-ED follow-up care, including: • The tools and technology they use • The information they provide
		Operational discharge
11	ED physician prepares the discharge instructions	Activities performed by the ED physician to prepare the patient's AVS, including: • The tools and technology they use • The information they provide • Sending e-prescriptions to the pharmacy or preparing written prescriptions
12	ED nurse documents discharge process in EHR	Activities performed by the ED nurse to document the patient's discharge process in the EHR, including what information they document.
13	ED nurse augments ED physician discharge instructions	When the ED nurse adds additional information to the discharge instructions after they have been written by the ED physician. May include adding pre-formatted information sheets.
14	ED nurse talks with patient/care partner about discharge instructions	When the ED nurse brings in the print AVS and discusses it with the patient and care partner.

Note: ED: emergency department, APP: advanced practice provider (e.g., physician assistant, nurse practitioner), PCP: primary care physician, AVS: after visit summary

5.5.2 Collaboration during the discharge process

We identified patient-clinician collaboration in 60 excerpts, occurring in 7 of the 14 discharge activities, see Figure 5. Three of the collaborative interactions, i.e., learning, coordinating, and communicating, were present during the discharge process; we found no instance of decision making. Table 12 defines how the collaborative interactions occurred during the discharge activities.

Learning

We identified instances of learning in three excerpts for two collaborative discharge activities, see Table 12. During these discharge activities, learning was about the specialist clinician or ED nurse helping the patient or care partner learn how to use a newly acquired medical device; for example, learning how to use a sling. In an interview with an ED nurse, they talked about how learning to use a sling occurs during the discharge process *"we, depending on how they're going home, let's say they're going home with their spouse with a bruised shoulder, we make sure that they have a sling that, we show the spouse how, or the family member how to place the sling or how to adjust the sling so that they have that education on how to help at home."* (ED RN CM)

Coordinating

We found coordinating in 32 excerpts distributed throughout all 7 collaborative discharge activities. Patient, care partners, and the ED care team engaged in 7 different types of coordinating interactions (see Table 12): immediate coordination, coordination for after the patient leaves the ED, or a combination of both.

Immediate coordination included coordinating transportation to help the older adult leave the ED (e.g., via wheelchair) (1 excerpt) and coordinating transportation home from the ED (8 excerpts), see Table 2 for definitions for these coordinating interactions and for where they occur in the discharge process. Table 13 outlines examples from the data for immediate coordination.

Coordination for after the patient leaves the ED included: (1) follow-up with primary care physician (PCP) (15 excerpts), (2) follow-up with specialist physician (3 excerpts), (3) follow-up with community-based resources (1 excerpt), and (4) home care (2 excerpts). Table 12 provides definitions for these four coordinating interactions and denotes where they occur in the discharge process. Table 13 presents examples from the data for how coordination for after the patient leaves the ED occurs in each of the five coordinating interactions.

Medication management was the one coordinating interaction that included both immediate coordination and coordination for after the patient leaves the ED and occurred in two collaborative discharge activities (see Table 12). Immediate coordination of medication management included how to acquire medications from the hospital pharmacy (1 excerpt), whereas coordination for after the patient leaves the ED included how to acquire medications at a community pharmacy and how to take the medications (1 excerpt); see Table 13 for examples from the data.

Communicating

We identified communicating in 57 excerpts, occurring in 6 of the 7 collaborative discharge activities. Communication differed based on where in the discharge process it occurred and which discharge activities were involved.

The first group of collaborative discharge activities with communicating were those where the ED physicians, specialist physicians, and ED nurses talked with the patient about being discharged home, as shown in the three discharge activities in the dashed box in Figure 5. Communicating interactions about the patient being discharged home occurred between the patient and care partner, ED physician/APP (20 excerpts), specialist physician/APP (2 excerpts), or the ED nurse (14 excerpts) and included discussion of the patient's diagnosis, home care, medication management, and red flags (i.e., reasons to return to the ED). The second collaborative discharge activity with communicating was when the patient and care partner talked with the social worker about community-based resources (2 excerpts). Third, was when the patient and care partner and ED care team were preparing the patient for departure from the ED (8 excerpts). Lastly, communicating interactions occurred during the operational discharge when the patient and care partner and ED nurse discuss the discharge instructions (11 excerpts). See Table 12 for definitions of how communicating occurred during these collaborative discharge activities and Table 14 for examples from the data.

Table 12. Collaboration during discharge activities.

Collaborative activities in the discharge process	**Learning**	**Coordinating**	**Communicating**
ED physician/APP talks with patient/care partner about being discharged home		Interactions about… • **Follow-up with PCP**: recommendation by ED physician/APP to follow-up with PCP, scheduling follow-up appointment with PCP, follow-up treatment with PCP (e.g., removing stiches) • **Follow-up with specialist**: recommendation by ED physician/APP to follow-up with specialist, scheduling follow-up appointment with specialist, follow-up treatment with specialist (e.g., MRI) • **Medication management**: coordination about where/when to pick up medications and how to take them	ED attending, resident, or APP **explain that the patient will be discharged home and talk with the patient and care partner about:** • *Description of patient's diagnosis (e.g., result of scans, tests)* • *Home care (e.g., wound care, monitoring vitals)* • *Medication management (e.g., how to take medications, medication side-effects)* • *Red flags (e.g., when to return to the ED)*
Specialist physician/APP talks with patient/care partner about being discharged home	Specialist physician helps the patient or care partner **to learn how to use a new medical tool/device (e.g., sling)**	Interactions about… • **Follow-up with specialist**: recommendation by specialist physician/APP to follow-up with specialist, scheduling follow-up appointment with specialist	Specialist physician (e.g., orthopedic surgery resident, surgery fellow) **explains that the patient will be discharged home and talks with the patient and care partner about:** • *Description of patient's diagnosis (e.g., result of scans, tests)* • *Home care (e.g., wound care, monitoring vitals)* • *Red flags (e.g., when to return to the ED)*
ED nurse talks with patient/care partner about being discharged home	ED nurse helps the patient or care partner **to learn how to use a new medical tool/device (e.g., sling)**	Interactions about… • **Follow-up with PCP**: coordination about recommendation to follow-up with PCP, scheduling follow-up appointment with PCP • **Home care**: coordination about who is going to stay with the patient and who will be able to help with patient mobility at home • **Medication management**: coordination about where/when to pick up medications (e.g. wayfinding to ED/hospital pharmacy)	ED nurse **explains that the patient will be discharged home and talks with the patient and care partner about:** • *Description of patient's diagnosis (e.g., result of scans, tests)* • *Home care (e.g., wound care, monitoring vitals)* • *Medication management (e.g., how to take medications)*

Social worker informs patient/care partner about community resources		Interactions about… • **Follow-up with community-based resources (e.g. A Place for Mom)**	Social worker **provides information or discusses community resources with patient and care partner.**
ED nurse and/or social worker helps patient coordinate transportation home from ED		Interactions about… • **Coordination of transportation home from ED**	
ED care team members prepare patient for departure from ED		Interactions about… • **Coordination of transportation out of the ED (e.g. via wheelchair)**	ED care team members **discuss activities performed in the ED to prepare patient to depart**: • *Gathering patient's personal effects* • *Helping patient dress* • *Removing IV, pulse/oxygen monitor, etc.* • *Bringing in wheelchair and providing directions to help patient exit ED* • *Helping patient perform oral challenge, road test, and toileting*
ED nurse talks with patient/care partner about discharge instructions		Interactions about… • **Follow-up with PCP**: recommendation to follow-up with PCP, scheduling follow-up appointment with PCP, what to bring to follow-up appointment with PCP	ED nurse brings in the printed after visit summary (AVS) and **discusses it with the patient and/or care partner**

Table 13. Exemplary data on coordinating during the discharge process.

Coordinating interactions	**Immediate coordination**	**Coordination for after patient leaves ED**	**Examples from the data**
Coordinating transportation out of the ED (e.g., via wheelchair)	X		*"ED nurse asked if the patient wanted a wheelchair to be escorted out of the ED. The patient said "yes" and that she didn't want to walk…ED nurse left to get a wheelchair…ED nurse returned with a wheelchair and said that she'd leave it in the room so that whenever the patient's daughter arrives, the patient would be ready to go." (PCCI 19)*
Coordinating transportation home from the ED	X		*"ED nurse asked the patient the best way to get her home. She asked if the patient drove. The patient said "no" and then asked if they had her daughter's phone number… [ED nurse] verified the patient's daughter's phone number. ED nurse used her cell phone to call the patient's daughter. The patient's daughter did not pick up but then called back shortly thereafter. ED nurse explained that the patient was ready for discharge and the daughter said that she would be there in 15 minutes and then the two hung up the phone" (PCCI 19)*
Follow-up with PCP		X	*"our recommendation is that you follow through your primary care physician in two days. So if you could give them a call when you leave the emergency room to schedule that follow-up appointment, that would be great." (ED RN DB)*
Follow-up with specialist physician		X	*"The attending said that the patient would go home and likely go to an ortho clinic and that that it would be possible that he would need to get an MRI there." (PCCI 4)*
Follow-up with community-based resources		X	*"The social worker recommended that the family seek a senior care navigator through A Place for Mom as they would know better than she about senior care options." (PCCI 17)*
Home care		X	*"ED nurse asked the family if the patient could either stay at one of their homes or if one of them would be willing to stay with the patient One family member offered to stay with the patient, and another offered for the patient to come to her house." (PCCI 3)*
Medication management	X	X	*"The family was worried because it was around 4 hours before the patient would be going to bed and they still had not yet gotten the prescription filled. nurse 2 said that he would show the family where the pharmacy is located." (PCCI 3).* *"The ED resident reminded the patient about a medication she would need to take. The patient asked where she could get this medication. The ED resident asked which pharmacy the patient preferred. The patient told her the name of her pharmacy, and the resident said that the patient should go get that medication tomorrow. The ED resident told the patient that she would need to take the medication two times per day and began to list the side effects of the medication" (PCCI 20)*

Table 14. Exemplary data on communicating during the discharge process.

Activities in the discharge process	**Examples from the data**
ED physician/APP talks with patient/care partner about being discharged home Specialist physician/APP talks with patient/care partner about being discharged home ED nurse talks with patient/care partner about being discharged home	*"The ED resident told the patient that she would need to follow up with either her PCP or urgent care to get the staples taken out. The patient asked if she could wash her hair. The ED resident that that she should not shampoo her hair within the first 24 hours."* (PCCI 27) *"The orthopedic surgical resident talked to the patient about the next steps with respect to care for his shoulder including the placement of the sling, pain control and the integration of exercises over the next few days*." (PCCI 4) *"ED nurse came into the room and told the patient that the resident had prescribed her a nausea medication. He walked through when the patient should take her medications and in what order. ED nurse said that he had talked to the UW pharmacists about getting the patient's medication filled at the hospital pharmacy and that it would be ready in about 20 minutes."* (PCCI 3)
Social worker informs patient/care partner about community resources	*"They might even be as simple as just, you know, if we're really busy, social worker can call family and talk with family. They've helped with that. I know on certain occasions, especially in traumas, you know, like falls, social work can do that. Social work communicates with family here if they have further questions or things like that. Or even just like support, you know, if it's a really bad fall that maybe the patient is not doing well, social work is a good supporter, just being there for family and things too. It's very specific to patients, you know, how severe or not severe are they and stuff like that."* (ED RN JZ)
ED care team members prepare patient for departure from ED (e.g., road test, final vital signs, toileting)	*"The ED resident said that he would get everything set up for her to get a road test, oral challenge and get fitted for the sling"* (PSLL 3)
ED nurse talks with patient/care partner about discharge instructions	*"ED nurse returned with the patient's discharge paperwork and put the patient in the wheelchair. The patient inquired about one of her medications (Tramadol) and nurse3 warned her to never take it when she's alone. nurse3 gave the paper instructions to the patient and reviewed the following: you were seen for a fall, you got a CT scan that revealed no injury, you were given Tylenol, you are to see your PCP within 2 days these are your most recent vitals"* (PCCI 19)

5.6 Discussion

This qualitative study drew on patient-centered observations of 7 older adults and their care partners and interviews of 7 ED physicians and nurses. We identified 14 activities that compose the discharge process in the ED and mapped them onto a process map to show how they are distributed throughout the ED stay, specifically, from the time the patient is considered medically ready for discharge to when they physically leave the ED. Further, we found that collaboration, patient work, and clinician work occur during the discharge process. For the discharge activities with collaboration, we identified and defined the types of collaboration (i.e., learning, coordinating, communicating) that occur during the activity. The important contributions of this study are (1) to identify, define, and map the activities that occur during the ED discharge process (see Figure 5 and Table 11) and (2) identify and define how collaboration occurs during the ED discharge process (see Table 12).

In an interview with an ED nurse, they said "*"I feel like the discharge process starts way before the [discharge instruction] is handed out."* The results of our study corroborate this statement made by the ED nurse as we found 14 discharge activities distributed throughout the older adult's ED stay. These results emphasize the need to reconceptualize the ED discharge process as a process distributed throughout the ED stay that goes beyond the activities performed during operational discharge. Further, we show that some activities in the discharge process are not sequential and can be repeated and that others are sequential and occur only once during the discharge process, as is the case during the operational discharge. Lastly, we found that multiple different clinicians (e.g., ED physicians, orthopedic surgeons) are involved in the different

activities throughout the ED discharge process. These key findings can inform the design of interventions for improving the ED discharge process.

Interventions should be designed to support multiple activities and account for the potential that activities may be repeated multiple times throughout discharge process. This is in line with the systematic review by Hughes et al. (2019), who found that studies that used two or more intervention strategies, which could have addressed more than one discharge activity, were most effective in improving patient safety and experience outcomes. In addition, ED discharge process interventions need to account for who is involved in the activities, specifically accounting for how older adults and their care partners are the only constant throughout the ED stay. Interventions should be designed using iterative collaborative design methods, involving the roles that are represented in the process throughout the design and implementation of the intervention.

Our findings show that collaboration, patient work, and clinician work occur during the discharge process. Further, during collaboration, older adults, care partners, ED care team members, and other clinicians (e.g., orthopedic surgeon) engage in learning, coordinating, and communicating interactions. We also found that more than one collaborative interaction can occur within a single discharge activity, which points to how they are interrelated. For example, learning, coordinating, and communicating all occur when the ED nurse talks with the patient and care partner about being discharged home. These results indicate the need for ED discharge interventions to design for older adult and ED clinician collaboration. In other words, ED discharge interventions need to be designed to improve learning, facilitate coordinating along the continuum of the patient journey, and enhance communication. In addition, we found that older

adults and their care partners engage in their own work (i.e., patient work) during the ED discharge process; hence, there is a need to support the work that older adults and care partners do in clinical settings such as the ED. We did not find any collaborative interactions about decision making, which may result from the scope of the research. Our study did not include disposition decision making (i.e., the decision-making process about where to discharge the patient), a process that may occur before or at the same time as the discharge process. This may explain why we did not identify decision making during the discharge process in our data analysis. Yet, the absence of decision making may also indicate an opportunity to design interventions that further engage patients in care decisions during the discharge process.

Limitations and future research

The findings from our study should be examined in consideration of several limitations. First, this study was conducted as part of a larger study, which focused on older adult patients and their care partners who presented to the ED having experienced a fall, which represent a specific population and setting and may limit the transferability of the results. Second, we did not collect demographic information from the older adult participants, their care partners, or the ED physicians and nurses; therefore, the participants included in our study may not be representative of all older adults, their care partners, or ED clinicians, which limits the generalizability of our results. Third, due to the limited number of observations and interviews, and the secondary analysis, we may not have identified every activity that occurs or all the ways that patients, care partners, and the ED care team collaborate during the discharge process. Future work is needed to expand our understanding of the ED discharge process and how collaboration occurs during

the discharge process; for example, where disposition decision making fits in the discharge process and how collaboration occurs during the disposition decision making process.

Our study identified three types of collaboration and when they occur during the discharge process, which only represents one process in one care setting. Future research could build on our findings by examining other processes in the ED (e.g., diagnosis and treatment) or processes in different care settings (e.g., hospital, primary care). We identified patient work that occurs in the ED discharge process; future research should engage older adults and their care partners to better understand the work that they do in clinical settings, such as the ED. Overall, there is a need for research on how collaboration occurs during health care processes and how to design interventions to support and encourage collaboration during multiple activities in the discharge process.

5.7 Conclusion

The discharge process is composed of multiple activities distributed throughout the ED stay. Collaboration, including learning, coordinating, and communicating, occurs during the discharge process. Using the results of this study, researchers and practitioners can modify or develop care transition interventions that target specific activities during the discharge process and support collaboration.

Chapter 6: Work System Barriers and Facilitators to Collaboration during the Emergency Department Discharge Process: Comparison of Multiple Perspectives

This chapter is presented in the format of a manuscript prepared for Applied Ergonomics.

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Running head: ED discharge collaboration

Manuscript type: research article

Word count of text:

Acknowledgments

This research was supported by grant 5R18HS026624 from the Agency for Healthcare Research and Quality (AHRQ), grant UL1TR002373 from the Clinical and Translational Science Award (CTSA) program, through the NIH National Center for Advancing Translational Sciences (NCATS), and grant K24AG054560 from the National Institute on Aging. The project was also supported by the University of Wisconsin School of Medicine and Public Health through Wisconsin Partnership Program funding to the Wisconsin Institute for Healthcare Systems

Engineering and the Health Innovation Program. The content is solely the responsibility of the authors and does not necessarily represent the official views of AHRQ or the NIH.

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6.1 Abstract

Objective

To identify the work system barriers and facilitators that older adults and ED nurses experience during collaboration in the operational discharge process. To compare the barriers and facilitators experienced by older adults and ED nurses to collaboration in the operational discharge process.

Background

Older adults experience a myriad of challenges during the ED discharge process, e.g., inadequate instructions and ineffective communication, which may result in negative patient safety outcomes and experience. A human factors engineering (HFE) systems approach (i.e., SEIPS) can be used to understand the work system barriers and facilitators to older adults and ED nurses collaboration during the discharge process.

Methods

We analyzed 15 older adult ($\geq$ 65 years) and 10 ED nurse interviews using a staged approach. First, using the SEIPS model, we conducted a deductive analysis to identify work system barriers and facilitators to collaboration. We then performed an inductive analysis using the constant comparative method to identify work system barrier and facilitator dimensions. Last, we did a

comparative analysis of the work system barrier and facilitator dimensions reported by older adults against those reported by ED nurses.

Results

We identified 16 dimensions of barriers and facilitators for work system elements and their interactions. We identified barriers and facilitators that were common to older adults and ED nurses, unique to either older adults or ED nurses, or divergent. Divergence occurred along four of the dimensions and was when a barrier (facilitator) reported by the older adult was a facilitator (barrier) reported by the ED nurse. We found seven common barriers, eleven common facilitators, 5 barriers and facilitators unique to older adults, four barriers unique to ED nurses, and 5 divergent perspectives along 4 of the dimensions.

Conclusion

It is critical to use a systems approach to design for all perspectives that are involved in complex, collaborative health care processes, such as the ED discharge process.

Keywords: collaboration, SEIPS, multiple perspectives, barriers, facilitators, ED discharge

6.2 Introduction

Challenges of the ED discharge process for older adults

In 2020, over 20% of all ED visits in the U.S. were made by older adults, totaling over 26 million visits to the ED (Cairns & Kang, 2020). A high-risk process that occurs during an older adult's ED visit is their care transition between the ED and home, i.e., the discharge process. As a high-risk process, ED discharge requires effective information, authority, and responsibility transfer (Carayon & Wood, 2010). Yet, studies by Goodridge et al. (2018) and Kolk et al. (2021) report that older adults often receive inadequate instructions and experience ineffective communication during the discharge process, which may result in negative patient experience and poor patient safety outcomes (e.g., return visits to the ED). Further, the challenges experienced by older adults during the ED discharge process often fail to align with their values, such as having a clear plan for how to care for themselves at home (Vaillancourt et al., 2017). Therefore, understanding what happens during the discharge process is necessary to improve older adults' experience in the ED and post-ED patient safety outcomes.

A systems approach to the ED discharge process

The Systems Engineering Initiative for Patient Safety (SEIPS) model has been widely used to analyze complex care processes and to design interventions to improve health care outcomes (Carayon et al., 2014b; Carayon et al., 2021; Holden & Carayon, 2021). The SEIPS model integrates the five interacting elements of the work system model (i.e., person, task, technology and tools, organization, and environment) (Smith & Carayon-Sainfort, 1989) with the structure, process, outcome (SPO) model of Donabedian (1988). Using the SEIPS model we can understand how older adults and ED clinicians perform tasks together, using tools and technologies, within the organization and environment of the ED during the discharge process, and how that feeds forward into the older adult's experience and patient safety outcomes.

Collaboration in healthcare.

In SEIPS 2.0, Holden and colleagues (2013) distinguish patient work, professional (e.g., clinical) work, and collaboration within the process element of the SEIPS model. Collaboration is defined as "an evolving process whereby two or more social entities actively engage in joint activities aimed at achieving at least one shared goal." (Bedwell et al., 2012). The interactions between older adults and ED nurses during the discharge process can be conceptualized as collaboration. Collaboration is an evolving process during ED discharge as older adults often see multiple clinicians (e.g., ED nurses, ED physicians, specialist physicians), which may span a shift change, and the discharge instructions or disposition location may change based on new information. Further, collaboration occurs between two social entities, such as the older adult and the ED care team. Another way collaboration is represented in the ED discharge process is that collaboration requires active and reciprocal, but not necessarily equal, engagement in joint activities (e.g., when the ED nurse explains the discharge instructions to the older adult). Lastly, collaboration is work towards a mutually agreed upon shared goal. During the discharge process, the goal may be helping the patient prepare for a safe care transition between the ED and home. Integrating collaboration and the SEIPS model will allow for a health care focused approach to understanding collaboration as a process embedded within the work system; therefore, we can identify the work system barriers and facilitators that affect collaboration.

Work system barriers and facilitators from multiple perspectives.

The SEIPS model has been used to understand complex processes through the analysis of work system barriers and facilitators (Carayon et al., 2005; Carayon et al., 2019; Carayon et al., 2014a; Hose et al., 2023; Kelly et al., 2019; Musuuza et al., 2019; Wooldridge et al., 2020). Work system barriers and facilitator are conceptualized as the fit, or lack of fit, of work system

elements (Carayon et al., 2005). These work system barriers and facilitators feed into and can affect processes, such as the older adult and ED nurse collaboration during the discharge process. To our knowledge, only a few studies have analyzed work system barriers and facilitators from multiple perspectives (Hose et al., 2023; Kelly et al., 2019; Musuuza et al., 2019; Wooldridge et al., 2020). Kelly and colleagues (2019) identified barriers and facilitators to the use of a family centered rounds checklist in a pediatric hospital from the perspectives of senior residents and attending physicians. Musuuza et al. (2019) identified common, unique, and conflicting work system barriers and facilitators to the implementation of a C.difficile prevention bundle in an academic teaching hospital from the perspectives of nurses, physicians and environmental service personnel. Hose et al. (2023) identified barriers and facilitators to a team-based health IT for pediatric trauma care transitions from twelve different perspectives, including emergency medicine, anesthesia, surgery, and pediatric intensive care unit (PICU). Lastly, Wooldridge et al. (2020) identified barriers and facilitators to pediatric trauma care transitions (e.g., ED to PICU) from the perspectives of physicians, anesthesia, nurses, and support staff. These studies have explored work system barriers and facilitators from multiple clinical perspectives in a variety of clinical contexts (e.g., hospital, surgery, ED, PICU). Yet, no study has identified or compared work system barriers and facilitators to patient-clinician collaboration, such as the collaboration that occurs between older adults and ED nurses during the ED discharge process.

6.3 Research objectives

- To identify the work system barriers and facilitators that older adults and ED nurses experience to collaboration during the operational discharge process.

- To compare the barriers and facilitators experienced by older adults and ED nurses to collaboration during the operational discharge process.

6.4 Methods

This study was conducted as part of a larger study at the University of Wisconsin-Madison, which focused on designing a system of care that aids older adults who present to the ED after having experienced a fall transition to their next care setting (e.g. home, nursing home). As part of the study, a transdisciplinary team (e.g., HFE, ED clinicians, health IT, community members, patients, care partners) designed, and implemented an intervention to improve outcomes for older adults discharged home. The intervention consisted of four components: (1) EHR template for physician instructions, (2) redesigned after visit summary (AVS), (3) reminder about teach back, and (4) redesigned follow-up call. The intervention was implemented in the ED and evaluated using multiple methods, including interviews with older adults who had been discharged from the ED and ED nurses. Additional information on the intervention design and evaluation can be found in Carayon et al. (2023) (in progress).

6.4.1 Older adult interviews

Sample

We conducted semi-structured interviews with older adults (≥ 65 years) about their discharge experience and the WG3 intervention. The sample consisted of 15 older adults who had been discharged home from the ED. See Table 15 for demographic information.

Table 15. Demographic information for older adults discharged from the ED.

Demographics	Older adults interviewed (n=15)
Sex	
Male	8 (53%)
Female	7 (47%)
Age range (years)	
65-69	3 (20%)
70-74	8 (53%)

75+	4 (27%)
Marital status	
Currently married	8 (54%)
Separated	0 (0%)
Divorced	2 (13%)
Widowed	2 (13%)
Never married	3 (20%)
Living arrangement	
Home	15 (100%)
Assisted living	0 (0%)
Retirement community	0 (0%)
Nursing home	0 (0%)
Self-rated health (SF-8)^	
Physical component	51 (average or above)
Mental component	53 (average or above)
Education	
8th grade or less	0 (0%)
Some high school	0 (0%)
High school graduate/ GED	1 (7%)
Some college/technical school	1 (7%)
College graduate	7 (46%)
More that 4-year college degree	6 (40%)
Health literacy*~	
Inadequate	0 (0%)
Marginal	1 (8%)
Adequate	12 (92%)

Note: ^ for the SF-8 n=14, one older adult didn't complete one of the survey questions.

*Health literacy was measured using the BRIEF health literacy screening tool (Huan, 2009)

~ For health literacy, n = 13. Two patients did not answer one of the health literacy questions. One patient chose not to answer the second question of the BRIEF health literacy screening tool, which asks "How often do you have problems learning about your medical condition because of difficulty understanding written information?". Another participant chose not the answer the first question of the BRIEF health literacy screening tool, which asks "How often do you have someone help you read hospital materials?".

Recruitment and data collection

An HFE researcher and a nursing researcher trained an ED research coordinator (EDRC) to conduct the patient interviews. The HFE and nursing researcher created a qualitative interview

training protocol that included information about qualitative interviewing, the process to prepare for and conduct a qualitative interview, and tips for probing during a qualitative interview. The researchers shared the training protocol and the semi-structured interview guide with the EDRC and met with the EDRC twice to review the protocol and practice qualitative interviewing. During the practice, the EDRC would ask questions from the semi-structured interview guide and the researchers would answer as if they were a participant. After the practice, the researchers gave the EDRC constructive feedback (e.g., when additional probes would have been useful, how to manage non-response from a participant, how to redirect a participant back to the interview questions). Further, the researchers coordinated a practice interview with an older adult community member for the EDRC. The practice interview was audio-recorded. The HFE and nursing researcher reviewed the audio recording and gave the EDRC additional feedback.

Older adults who were eligible to participate in the PSLL study were recruited by an EDRC while they were in the ED. The EDRC would monitor the EHR track-board to identify patients who were eligible to participate. Inclusion criteria included older adult aged 65 or over who presented to the ED with a primary complaint of a fall having occurred within the past 48 hours; not a Level One Trauma; and power of attorney (POA), if older adult had an activated POA. Once an eligible older adult was identified, the EDRC would approach the ED clinician caring for the older adult and verify that they were appropriate to approach. If approved by the ED clinician, the EDRC would approach the older adult and care partner, if present, explain the PSLL study and obtain consent. After obtaining consent the EDRC would proceed with the first of three surveys. The second survey was administered by the EDRC to the patient once after the decision to discharge had been made. The third survey was conducted within one week after the older adult was discharged from the ED. For older adults who had been discharged home, the

EDRC would ask the older adult whether they would be willing to answer a few additional questions at the end of survey three. If the older adult agreed, the EDRC would proceed using the semi-structured interview guide, taking detailed notes throughout the interview. The post-survey 3 semi-structured interview data is what was used for this study.

The EDRC conducted 15 interviews over the phone during weekdays; the interviews lasted an average of 22.5 minutes (range = 12 to 34 minutes). We collected a total of 338 minutes of interview data. The interviews were audio recorded and professionally transcribed.

6.4.2 ED nurse interviews

<u>Sample</u>

The sample consisted of 10 ED nurses. The ED nurses had between 1.5-38 years of experience as an ED nurse and 1.5-23 years of experience at the University of Wisconsin Hospital ED. All 10 ED nurses worked the day shift, and one nurse also worked the evening shift.

<u>Recruitment and data collection</u>

Two HFE researchers conducted semi-structured interviews with the 10 ED nurses. ED nurses were recruited by the HFE researchers through a written announcement in the ED nurse weekly newsletter and verbal reminder during their daily huddle. During the interview, the HFE researchers used a semi-structured interview guide to ask the nurses for their perspective on the different components of the WG3 intervention, including the redesigned after visit summary (AVS), teach back method, and follow-up call. ED nurses were asked to reflect on how these intervention components fit into their work processes and how it affected their interactions with older adults and their care partners.

The HFE researchers conducted interviews on weekdays between 8:00 AM and 10:00 AM. The HFE researchers conducted the interviews virtually using Webex online video-conferencing

software. Before the start of the interviews, the ED nurse manager would log into the Webex meeting and set up the computer in a private conference room. The two HFE researchers would then wait in the Webex meeting for ED nurses to join. The HFE researchers conducted the interviews on a drop-in basis, with ED nurses entering the conference room and beginning the interview whenever they had time during their shift. The HFE researchers coordinated 5 different drop-in times with the ED nurse manager. ED nurses were able to join for 4 of the 5 drop-in times, with between 1 to 4 nurses joining for each of the 4 drop-in times. Interviews lasted an average of 15 minutes (range: 11-24 minutes). A total of 157 minutes of interview data were collected. The interviews were audio recorded and professionally transcribed.

6.4.3 Data analysis

We conducted a secondary qualitative data analysis of the 15 patient interviews and 10 ED nurse interviews. Secondary qualitative data analysis has been defined as "the use of an existing data set to find answers to a research question that differs from the question asked in the original or primary study." (Hinds et al., 1977). We used a type of secondary qualitative data analysis called analytic expansion (Thorne, 2013), which involves a secondary analysis of an original data set to ask new questions that had not been considered at the start of the study.

We performed the secondary qualitative data analysis in three stages. First, using the SEIPS model, we conducted a deductive content analysis of the older adult and ED nurse interview data to identify work system barriers and facilitators to collaboration at the time of discharge. Second, using the excerpts found in stage one, we conducted an inductive content analysis using the constant comparative method (Glaser, 1965) to identify emerging dimensions of work system barriers and facilitators. Lastly, we performed a comparative analysis of work system barriers and facilitators experienced by older adults and ED nurses along the dimensions identified in

stage two. Throughout all three stages of the analysis the researchers met to review the coding and iteratively refine the definitions, developing the codebook found in appendix H.

Stage 1

We used deductive content analysis (Elo & Kyngas, 2008) informed by the five work system elements (i.e., person, task, tools and technology, organization, and environment) and their interactions (Carayon et al., 2006; Smith & Carayon-Sainfort, 1989). The fit, or lack of fit, of work system elements creates barriers or facilitators in the work system (Carayon et al., 2005), which affect the collaboration between older adults and ED nurses during operational discharge. We identified the proximal, i.e., most immediate (Holden et al., 2013; Hose et al., 2023; Wooldridge et al., 2017), work system element or interaction and whether it was a barrier or facilitator. We also identified whether the work system barrier or facilitator pertained to collaboration, as defined by Bedwell et al. (2012).

Two researchers individually coded four older adult interview transcripts and four ED nurse interview transcripts in Microsoft Word using comment boxes. We coded each excerpt for (1) collaboration, (2) work system element or interaction, (3) barrier or facilitator, and (4) whether the barrier or facilitator was identified by the ED nurse for the patient or vice versa. We also wrote a short description of the excerpt as a memo. After coding each transcript, the researchers met to discuss discrepancies until consensus was reached and to further refine the codebook. We then input these coded transcripts into Dedoose (v.9.0.8).

For the next five older adult interview transcripts and five ED nurse interview transcripts, one researcher coded in Dedoose and the other coded in Microsoft Word. One researcher would compare the coding for each transcript and mark coding discrepancies or questions in Dedoose using a unique code and writing an explanation of the discrepancy or question as a memo. The

second researcher would review the marked excerpts and would write a response to the memo in Dedoose. The first researcher would then review the memo response, update the coding of the excerpt, and refine the codebook, if necessary. For any remaining questions or discrepancies, the two researchers would meet and discuss until consensus was reached.

The researcher coded the one remaining older adult interview transcript and six remaining ED nurse interview transcripts in Microsoft Word, which the second researcher and reviewed and input into Dedoose. The same unique code and memo process was used for any questions that arose while inputting the data.

After coding the 25 transcripts for work system elements or their interactions, barriers or facilitators, and collaboration, we exported the codes for 393 excerpts to Microsoft Excel. We created 6 tabs in Microsoft Excel for each work system element or interaction, i.e., person, technology and tools, technology and tools-task-organization, task-organization, environment, organization. Each tab included the excerpts, interviewee role (i.e., older adult, ED nurse), coding for barrier or facilitator, coding for whether the excerpt was identified by the ED nurse for the patient or vice versa, and a short descriptive memo.

Throughout stage 1, we identified potential emerging work system barrier and facilitator dimensions that could be used in stage 2. While coding, we iteratively identified and discussed potential emerging dimensions of work system barriers and facilitators and added them to a table in our codebook.

Stage 2

In stage 2, we conducted an inductive analysis (Elo & Kyngas, 2008) using the constant comparative method (Glaser, 1965) to identify and refine emerging dimensions of work system

barriers and facilitators. Two researchers individually reviewed the excerpts per work system element or interaction considering the potential emerging dimensions identified in stage 1. They then met and discussed their impressions of the data and developed a revised list of emerging dimensions. They used the revised emerging dimensions to code the excerpts in Microsoft Excel. Throughout stage 2, they iteratively reviewed the coding and codebook and refined, added, removed, and combined codes for the emerging dimensions. They identified and defined 16 dimensions in six work system elements and interactions.

Stage 3

Based on coding done in stage 2, we produced two lists of work system barriers and facilitators: (1) work system barriers and facilitators experienced by older adults and (2) work system barriers and facilitators experienced by ED nurses. We compared the lists to identify common, unique, and divergent perspectives along the identified dimensions. We used the definitions developed by Musuuza et al. (2019) for common and unique work system barriers and facilitators and adapted their definition of conflicting work system barriers and facilitators, which we renamed as divergent.

- Common: a barrier (or facilitator) reported by both older adults and ED nurses
- Unique: a barrier (or facilitator) reported by either older adults or ED nurses, but not both
- Divergent: a barrier identified by older adults that is a facilitator for ED nurses; or a facilitator reported by older adults that is a barrier for ED nurses.

We analyzed the data for common barriers and facilitators by looking for instances where both older adults and ED nurses discussed a certain dimension as either a barrier or facilitator. For example, when older adults and ED nurses talked about a dimension as only a barrier. We also

looked for instances where older adults and ED nurse talked about a dimension as a barrier and facilitator. In this case, we would (1) compare the older adult barrier list of excerpts to the ED nurse barrier list of excerpts and (2) compare the older adult facilitator list to the ED nurse facilitator list to identify commonalities.

We analyzed the data for unique barriers and facilitators by looking for instances where only older adults or ED nurses identified a certain dimension as a barrier or facilitator. For example, when older adults identified a dimension as a facilitator and ED nurse did not.

To analyze the data for divergent barriers and facilitators, we first identified dimensions where there was a potential for divergence. There was a potential for divergence when older adults identified barriers for a dimension that ED nurses reported as a facilitator; or when older adults identified facilitators for a dimension that ED nurses reported as a barrier. To analyze for divergence, we compared the list of facilitators (or barriers) mentioned by older adults to the list of barriers (or facilitators) mentioned by ED nurses. Using the definitions developed for the dimensions in stage 2, we summarized how older adults talked about the dimension as a barrier (or facilitator) and how the ED nurse talked about the dimension as a facilitator (or barrier). We then conducted a one-to-one comparison of each of the summaries to identify divergence along the work system dimension.

6.5 Results

6.5.1 Work system barriers and facilitators reported by older adults and ED nurses

We identified 16 dimensions for six work system elements and interactions. We identified barriers and facilitators in 11 dimensions, barriers in three dimensions, and facilitators in two dimensions. We also identified 24 excerpts where older adults identified work system barriers

and facilitators for ED nurses or when ED nurses identified work system barriers and facilitators for older adults.

Dimensions of work system barriers and facilitators to collaboration

Table 16 outlines the work system barrier and facilitator dimensions and their definitions. The first column of Table 16 presents the 6 work system elements and interactions, the second column presents the 16 identified dimension, and columns three and four present the barrier and facilitator definitions for each dimension, respectively. Table 17 has exemplary quotations for barriers and facilitators for each dimension. If a dimension barrier or facilitator was identified by both the older adult and ED nurse perspective, a quote from each perspective is included. For example, older adults and ED nurses identified the dimension older adult characteristics under the person work system element as a barrier, therefore, there are example quotations from both the older adult and ED nurse in Table 17. If a dimension was only identified by one perspective (i.e., the older adult or the ED nurse) an example quotation is only included from that perspective. For example, the dimension lack of care continuity under the work system element organization was only identified by older adults, therefore, only example quotations from older adults are included in Table 17.The frequency of excerpts with barriers and facilitators across the 16 dimensions reported by older adults and ED nurses can be found in Appendix I.

Work system barriers and facilitators identified from the other perspective

We identified 24 excerpts where work system barriers and facilitators were identified from the other perspective. Table 18 has exemplary quotes for instances were older adults identified work system barriers and facilitators for ED nurses or when ED nurses identified work system barriers

and facilitators for older adults. See Appendix J for a count of these excerpts across the 16 dimensions. For the remaining discussion of the results, we concentrate on the work system barriers and facilitators identified and experienced by older adults and by ED nurses.

Table 16. Dimensions of work system barriers and facilitators to collaboration during ED operational discharge.

Work system elements and interactions	Dimensions	Barrier definition	Facilitator definition
Person	Older adult characteristics	Older adult characteristics, such as ***emotions*** (e.g., nervous, distracted, exhausted), ***physical state*** (e.g., altered/limited cognition, limited hearing), and ***knowledge*** (e.g., language, health literacy), that hinder collaboration.	Older adult characteristics, such as ***knowledge*** (e.g., health literacy), that facilitate collaboration.
	ED nurse characteristics		ED nurse characteristics, such as ***knowledge of the patient, their conversational style,*** **and** ***helpfulness,*** that facilitate collaboration.
Technology and tools	General perceptions of AVS	***Overall negative perceptions*** of the AVS. For example, the AVS is generic.	***Overall positive perceptions*** of the AVS. For example, the AVS is concise, adequate, or easy to read.
	Format of AVS	The AVS is poorly formatted with regards to the ***layout*** (e.g., font size, bolding, bullet points), and ***organization*** (e.g., flow of information, location of information).	The AVS is well formatted with regards to the ***layout*** (e.g., font size, bolding, bullet points), and ***organization*** (e.g., flow of information, location of information).
	Content of information on AVS	The AVS contains ***information*** that is ***not useful*** (e.g., medications, allergies, seatbelts), or ***not tailored to the older adult*** (i.e., generic, older adults do not understand), or is missing information (e.g., follow-up).	The AVS contains ***useful information*** (e.g., discharge instructions, medications, follow-up) that is ***presented clearly*** (i.e., tailored to the older adult, no medical jargon).
	Amount of information on AVS	The AVS has ***too much information***.	The AVS has an ***adequate amount of information***.
Technology and tools – Task - Organization	Older adult and ED nurse communication with the AVS	The ***AVS presents challenges to communication*** between the older adult and the ED nurse; e.g., challenges to communicating information on the AVS when discharging another nurse's patient or when explaining extra information on AVS.	The ***AVS supports communication*** between the older adult and ED nurse; e.g., ED nurse points out information to older adult.
Task-Organization	Quality of communication	The ***quality of the communication*** between the older adult and the ED nurse is ***inadequate***; e.g., ***too much*** or ***not enough*** is being discussed (e.g., no discussion of AVS, patient does not understand).	The ***quality of communication*** between the older adult and the ED nurse ***is optimal***; e.g., it is descriptive and thorough (i.e., provides adequate information to patient), the nurse presents things clearly (e.g., tailored to the older adult, repeated, verbal and written).
	Content of communication	***Pertinent/important information is not communicated***; e.g., what happened in the ED (e.g., diagnosis, tests/scans done, results), medications,	***Pertinent/important information is communicated***; e.g., such as: what happened in the ED (e.g., diagnosis, tests/scans done, results), medications, red flags (i.e.,

		information available in EHR, home care, follow-up care, and anticipated recovery trajectory.	when to return to the ED), home care, follow-up care, and anticipated recovery trajectory.
	Questions and answers		Both the older adult and the ED nurse ***ask and answer questions.***
	Teach back	There are ***challenges to teach back done by the ED nurse;*** e.g., no ideal time for teach back.	The ***teach back done by the ED nurse is effective***; e.g., teaching older adult about medications, medical devices (i.e., catheter, sling, splint, walker), wound dressing, and red flags.
Environment	Physical environment	The physical environment is ***suboptimal for older adult and ED nurse communication;*** e.g., discharge process in hallway.	
Organization	Time availability in ED	There is ***time pressure*** at the time of discharge.	*There is* ***sufficient time*** at the time of discharge.
	Time pressure experienced by older adults	Older adults experience time pressure and want ***to leave the ED.***	
	Care partner in ED	There are ***limits in the number of care partners*** allowed to be present in the ED.	***Presence of care partner*** in the ED is beneficial.
	Lack of care continuity	***The lack of continuity in ED nurse care presents challenges*** for the older adult, e.g., because of shift change/handoffs or the larger number of nurses caring for the older adult.	

Notes: AVS: After Visit Summary

Table 17. Exemplary quotations of barriers and facilitators for the 16 dimensions of the work system.

Work system elements and interactions	Dimensions	Barrier quotes	Facilitator quotes
Person	Older adult characteristics	"But you know, just, I was thinking way ahead. So your mind is not, at least mine is, was not what it normally would be. You know, you're kind of jumping all over the place." (Pt 1). "they're not hearing it, or they've been medicated" (ED RN 7)	"I understand the medical terminology" (Pt 1) "I was a nurse at Children's Hospital there for 30 years, so it's not like I'm a naïve person in the emergency room. I mean, I know what they're doing and why they're doing it, so I didn't have to play catch up much with what they were doing." (Pt 13)
	ED nurse characteristics		"So if it's a patient that I've had for several hours, and I'm familiar with their, kind of their treatment, their plan of care, their history, kind of where they're at like with the understanding of medical information, 100%." (ED RN 4) "I thought that the nurse was very, very helpful." (Pt 4) "The nurse was extremely knowledgeable of, you know, the events of why I was there and what I was attempting to do." (Pt 5)
Technology and tools	General perceptions of AVS	"No, it was pretty generic" (Pt 11)	"I like how it's very simple and easy to read, and it's just very concise. " (ED RN 9)
	Format of AVS	"My suggestion would be to make the phone number for the emergency room a little bit bigger because when we say, hey, if you have any questions, you can call us back you cannot read the numbers at all. They're so small, and they, for whatever reason with the printers, you can barely read them. So not that I want people to call us back, but I feel like that information should be a little bit more accessible." (ED RN 7)	"And then like you made, the font is large, so it just, it's just cleaner." (ED RN 6) "But I think the important stuff was on the first couple of pages, which was good." (Pt 4)

		"If it [medication information] was on the first page, I feel like it would be easier for the patients to pinpoint everything they need to know on the first page." (ED RN 3).	
	Content of information on AVS	"they had things on them that didn't apply to my condition." (Pt 12) "Oh, and then they have a list of all my medications. That's kind of a waste. I know what they are, and that just, you know, adds another page of stuff that I don't really look at. I know what my medications are." (Pt 10)	"Everything is just right there. Like you just hit a button, and, literally, everything is there. The discharge instruction, the follow-up plan, the medications, the pharmacy, everything is one document." (ED RN 4) "I think it's kind of just right. It kind of explains like you're having atypical chest pain and what that means. It's kind of like a layman's term. I think it's, the jargon has gotten a lot better, a little, yeah, I think it's just spot on." (ED RN 9) "Then there is follow up with the emergency department if needed. That makes sense to me. Follow up with my primary care physician, and that did make sense to me." (Pt 15)
	Amount of information on AVS	"On that same page is other information, and it says, let me see now. Well, part of that is pretty lengthy and detailed. I didn't really pay much attention to it, frankly." (Pt 10)	"So it's kind of nice that it's very concise and like all of the information is there." (ED RN 9)
Technology and tools – Task - Organization	Older adult and ED nurse communication with the AVS	"They handed me the paper, and that was all that was gone through. They just handed it to me." (Pt 7). [When discharging another ED nurse's patient] "I mean, I literally just read what's on the AVS because I don't know anything else." (ED RN 4)	"As well as the fact that things are bigger and bolded, like I said before, it just makes it easier for me to see what I'm exactly explaining to them." (ED RN 3) "Yeah, I think the most helpful thing was that she pointed out on the discharge instruction sheet the phone number I needed to call Monday morning." (Pt 13)
Task - Organization	Quality of communication	"we're like blah, blah, blah, blah, blah and you read all this stuff out. " (ED RN 7) "It's just that nobody could prudently take the time to go through it with me." (Pt 7)	"I thought the nurse, I thought he was very thorough on everything," (Pt 4) "geared towards my level and ability to understand the directives and the directions." (Pt 5)

		"Too many times they assume that everybody knows everything, and you don't." (Pt 6)	"I was told both verbally and in written form." (Pt 3)
	Content of communication	"I just wish I knew more about what to expect about how long it's going to take to really start feeling significantly better and so on." (Pt 15)	"Well, I guess, the fact that I was supposed to wash my abrasions and apply an ointment, you know, any kind of ointment to keep them moist, that was information I might not have known." (Pt 12)
	Questions and answers		"I was asking them my questions, and they were very helpful in answering those questions." (Pt 5) "And then I always ask the patients, you know, what questions do you have? " (ED RN 5)
	Teach back	"it's just not always an appropriate time." (ED RN 6)	"I look mostly at what the patient needs for their understanding and then try and tailor information that they're being handed out to make sure that they understand it all. But, definitely, I mean, you know, a laceration versus a broken bone, it's going to, their teach back is going to be very different." (ED RN 2) "Well, she got a walker for me, and she showed me how to use it, you know. Took about 15 minutes, I guess. But it was very helpful to me because I have to have the walker now at home." (Pt 2)
Environment	Physical environment	"I'm going to start talking to as we're walking out because I have another patient coming into your room as we speak. So it's hard. They're looking around. They're trying to figure out. It's a very different environment." (ED RN 7)	
Organization	Time availability in the ED	"And, literally, we discharge people in a minute" (ED RN 7) "I mean, we didn't really have a lot of time to chat. She was pretty busy, and so, you know, it's just kind of business, and, you know, kept things moving." (Pt 13)	"I had more than sufficient time with the nurse" (Pt 5) "No, I didn't feel rushed. I think they were, I mean, it was a busy, busy day, all right. I mean, I got moved from one room to another because of how busy, so I understood how busy it was. But I did not feel rushed." (Pt 14)

	Time pressure experienced by older adults	“Part of it was I wanted to get out of there” (Pt 12) “I guess, especially in the ER, it’s just that people are in a hurry because they’ve been here for like eight hours, and they want to leave.” (ED RN 3)	
	Care partner in ED	“Especially now with how many family members, or limited family members, it’s harder depending on who it is. Is it your 80-some-year-old spouse who also doesn’t get this? You know, and they’re like, okay, sounds good. And I think we’re okay, and they’re not. “ (ED RN 7)	“And if family is there, that’s always a huge help because I try to get them to participate too rather than me doing everything, having them actually do it,” (ED RN 3) “my wife was there, and she thoroughly understood everything that was being said. So it was great to have a second set of ears there to hear everything.” (Pt 4)
	Lack of care continuity	“Interviewer: And it really sounds like that the change in shift was really what kind of marked a . . . Respondent: Screwed everything up, yep.” (Pt 7) “And it got to the point where there was way too many people around and where are you from and what are you doing type thing.” (Pt 6)	

Table 18. Exemplary quotes of work system barriers and facilitators identified from the other perspective.

Work system elements and interactions	Dimensions	Barriers		Facilitators	
		Older adult for ED nurse	ED nurse for older adult	Older adult for ED nurse	ED nurse for older adult
Person	Older adult characteristics		"But I think sometimes it's just hard because, you know, we're discharging them from the ER, so you've probably got hard day, most of them" (ED RN 6)		
Technology and tools	General perceptions of AVS				"I think it just, that is it clarifies and makes it very, can't think of the word, I don't know, it just, it just makes it a lot more, it's just easy, right" (ED RN 6)
	Format of AVS		"If it was on the first page, I feel like it would be easier for the patients to pinpoint everything they need to know on the first page." (ED RN 3)		"So what I like is I like how, on the first page, things are bigger, so it's easier for the patient to see" (ED RN 3)
	Content of information on AVS				"I think patients like that too." (ED RN 1) [talking about the last dose of medication given in ED being listed on the AVS]
	Amount of information on AVS		"it's so overwhelming, the amount of information that we give them." (ED RN 7)		
Task-Organization	Quality of communication			"they were doing what they had to do. So I note that as a positive, making sure that I got the information I needed." (Pt 3)	

Organization	Time availability in the ED	"And I understand they were busy. And I know you're understaffed." (Pt 7)			

6.5.2 Comparison of barriers and facilitators identified by older adults and ED nurses

Across the 16 dimensions, we identified seven common barriers, eleven common facilitators, three barriers unique to older adults, two facilitators unique to older adults, and four barriers unique to ED nurses, see Table 19. Also, we identified 5 divergent perspectives in 4 of the 16 dimensions, see Table 20.

Table 19. Distribution of common, unique, and divergent work system barriers and facilitators.

Work system elements and interactions	Dimensions	Common	Unique		Divergent
			Older adult	ED nurse	
Person	Older adult characteristics	B	F		No
	ED nurse characteristics	F			No
Technology and tools	General perceptions of AVS	F	B		Yes
	Format of AVS	F		B	Yes
	Content of information on AVS	B, F			Yes
	Amount of information on AVS	B, F			No
Technology and tools – Task - Organization	Older adult and ED nurse communication with the AVS	B,F			No
Task - Organization	Teach back	F		B	No
	Quality of communication	B,F			Yes
	Content of communication	F	B		Yes
	Questions and answers	F			No
Environment	Physical environment			B	No
Organization	Time availability in the ED	B	F		Yes
	Time pressure experienced by older adults	B			No
	Care partner in ED	F		B	No
	Lack of care continuity		B		No

Table 20. Divergent perspectives between older adults and ED nurses.

Work system elements and interactions	Dimensions	Divergent perspective	Description of divergent perspectives
Technology and tools	Format of AVS	Yes	Older adults found that the flow of information on the AVS was logical, with important information on the first couple of pages (Pt 4, Pt 8,Pt 13, Pt 15). On the contrary, some ED nurses identified barriers to the flow of information in the AVS, such as instructions for how to take medication not placed on the first page (ED RN 3), and how the extra information on the diagnosis and care instructions are at the end of the AVS (ED RN 7).
	Content of information on AVS	Yes	A few ED nurses identified the medication list, the list of lab and imaging tests performed and the results, and follow-up information as facilitators, whereas some older adults identified these as barriers. Specifically, a few older adults reported that the medication list was unnecessary (Pt 10, Pt 14) and did not include information that was important to them, e.g., OTC medications to take (Pt 8). Some older adults also mentioned that the lab and imaging tests performed, and the results were missing or unclear (Pt 10). Lastly, follow-up information on the AVS was a barrier for some older adults, specifically information on how to schedule follow up was missing and follow-up recommendations with expiration dates was confusing (Pt 15). Some older adults mentioned some of the auto-populated information on the AVS as a facilitator, e.g., how to access information on MyChart, research opportunities, DAISY award, and attached information sheets with directions for home care, pain control, and red flag symptoms (Pt 10). On the contrary, a ED nurse talked about the auto-populated information on the AVS as a barrier (ED RN 2).
Task-Organization	Quality of communication	Yes	Older adults thought that communication at the time of discharge was descriptive, direct, adequate, thorough, and clear (Pt 4, Pt 5, Pt 9, Pt 12, Pt 14); further, that information repetition was useful (Pt 1, Pt 3, Pt 6). With a divergent perspective, ED nurses thought that they provided too much information at the time of discharge (ED RN 6, ED RN 7).
Organization	Time availability in the ED	Yes	Older adults reported time pressures in the ED but they still had enough time with the ED nurse at the time of discharge (Pt 5, Pt 9, Pt 10, Pt 13, Pt 14, Pt 15), whereas ED nurses identified time pressure in the ED as a barrier at the time of discharge (ED RN 1, ED RN 3, ED RN 4, ED RN 6, ED RN 7, ED RN 10).

6.6 Discussion

This qualitative study drew on interviews with 15 older adults and 10 ED nurses about the ED discharge process. We identified 16 dimensions of work system barriers and facilitators to collaboration between older adults and ED nurses during the operational discharge process. The 16 dimensions encompassed six work system elements and interactions. Further, we found that older adults and ED nurses identified barriers and facilitators from their own perspective and from each other's perspective. Lastly, our results show that older adults and ED nurses experience common, unique, and divergent work system barriers and facilitators during the operational discharge process. The key contributions of this study are to identify, define, and compare the dimensions of work system barriers and facilitators to older adult and ED nurse collaboration during the operational discharge process.

A distinct finding of our study was identifying common, unique, and divergent work system barriers and facilitators to collaboration during the operational discharge process experienced by older adults and ED nurses. Our results add to the limited number of studies that use a systems approach to understand complex care processes from multiple clinical perspectives (Hose et al., 2023; Kelly et al., 2019; Musuuza et al., 2019; Werner et al., 2021; Wooldridge et al., 2017) and those studies that include the patient perspective but limit the analysis to process activities and do not describe work system barriers and facilitators (Montague & Kleiner, 2009; Schultz et al., 2007).

Common work system barriers and facilitators

We identified common barriers and facilitators most frequently. Common barriers and facilitators show how the work systems of older adults and ED nurses overlap during the process

of collaboration, i.e., older adults and ED nurses may experience the same barrier or facilitator within their own work system. For instance, older adults and ED nurses both mention the dimension content of information on the AVS as a facilitator, which included things such as instructions for how the older adult should care for themselves at home. Older adults and ED nurses both mention the dimension time availability in the ED as a barrier, with both perspectives reporting an insufficient amount of time. We also identified instances where the older adult or ED nurse reported work system barriers or facilitators from the other's perspective. For example, we found that older adults reported time pressure in the ED resulting from understaffing and a busy ED as a barrier for ED nurses, which is also a barrier that ED nurses reported for themselves. The barriers and facilitators that the older adults and ED nurses identified for the other perspective may imply that they are aware of their role in collaboration and the barriers and facilitators experienced in each other's work systems.

Unique work system barriers and facilitators

We also identified work system barriers and facilitators unique to either the older adult or ED nurse's perspective. Older adults discussed how their characteristics (e.g., their knowledge of medical terminology, previous health care experiences) helped facilitate collaboration during the operational discharge and how lack of continuity in ED nursing care was a barrier to collaboration. These unique barriers and facilitators reported by older adults but not ED nurses draw attention to the older adult's role as the only constant throughout their patient journey (Carayon et al., 2020). Only older adults are privy to their previous experiences and medical knowledge that they have acquired throughout their patient journey, which may be why only older adults identified their knowledge as a facilitator to collaboration. In addition, older adults

experience the lack of ED nursing care continuity while they are in the ED, whereas ED nurses do not see the discontinuity because they are busy caring for other patients. ED nurses also reported unique barriers, such as the format of the AVS, challenges to teach back, and limit for number of a care partners allowed. These unique barriers identified by the ED nurses reveal their clinical perspective and deep understanding of how care is provided in the ED. For instance, ED nurses may have experience using the teach back method at different points in time during the ED visit and, therefore, are able to recognize the barrier of ED discharge as an inappropriate time for teach back.

Divergent work system barriers and facilitators

Lastly, we identified work system barriers and facilitators where older adults and ED nurses had divergent perspectives. To our knowledge, this is the first study that identified divergent work system barriers and facilitators from the patient (i.e., older adult) and clinician (i.e., ED nurse) perspectives. We found divergence for the following dimensions: format of AVS, content of information on AVS, quality of communication, and time in the ED. Older adult and ED nurse perspectives diverged for the dimension quality of communication: older adults reported that the communication during the operational discharge was descriptive, direct, thorough, and clear (i.e., a work system facilitator), whereas ED nurses reported that they provide too much information during the operational discharge (i.e., a work system barrier). Another instance of divergence occurred for the dimension content of information on the AVS. Older adults found some information on the AVS unnecessary (e.g., medication list), i.e., a work system barrier; on the contrary, ED nurses thought including this information on the AVS was useful, i.e., a work system facilitator. These divergent perspectives may indicate that older adults and ED nurses

have separate work systems that may not completely overlap during shared processes, such as the operational discharge process in the ED.

Altogether, the common, unique, and divergent work system barriers underline the importance of including and understanding all perspectives that are involved in complex, collaborative health care processes, such as the operational ED discharge process. Further, our results underscore the importance of using a multi-perspective systems approach to improving the discharge process. Any effort to redesign the ED discharge process should consider how to mitigate common barriers and enhance facilitators. Further, the redesign effort must consider the work system barriers and facilitators that are unique to each perspective. Finally, and most challenging, redesign efforts need to find a solution that balances divergent perspectives, in other words, mitigates a barrier for one perspective while not eliminating the facilitator from the other perspective.

Human-centered design (HCD) may be a solution to redesigning the ED discharge process to account for common, unique, and divergent work system barriers and facilitators. Human-centered design provides an approached that integrates HFE methods and brings together multiple perspectives to express their design needs through open communication (Carayon et al., 2022). Further, it provides a mechanism to manage divergent perspectives and converge on a design (Détienne, 2006; Hose et al., 2023) that helps to balance the work system, i.e., eliminate barriers and enhance facilitators without creating new barriers for any of the roles involved in collaboration (Carayon, 2009). Two projects, one on care transitions for pediatric trauma patients (Carayon et al., 2022; Hoonakker et al., 2021; Wooldridge et al., 2020) and the second on family-centered rounds for in-patient pediatric patients (Carayon et al., 2014a; Cox et al., 2017;

Kelly et al., 2013; Xie et al., 2015) are case examples of the integration of HCD and HFE methods in health care. For the pediatric trauma care transition project, Carayon et al. (2022) used a HCD processes guided by the work system barrier and facilitator dimension: team cognition identified by Wooldridge et al. (2020) to design a Teamwork Transition Technology (T3). Through a scenario-based evaluation, T3 was found to be a highly usable technology by the clinicians involved in the pediatric trauma care process (i.e., ED, operating room, and pediatric intensive care unit) (Hoonakker et al., 2021). For the family-centered rounds project, Carayon et al. (2014a) identified work system barriers and facilitators and Kelly et al. (2013) identified strategies that were integrated into the HCD design process of a family-centered rounds checklist, as discussed by Xie et al. (2015). In a randomized trial by Cox et al. (2017), they found that use of the family-centered rounds checklist improved completion of the checklist items and that specific checklist items positively influenced family engagement and perceptions of safety. These examples provide evidence towards the use of HCD and HFE methods to involve multiple perspectives in the redesign of health care systems to mitigate work system barriers and enhance facilitators.

Limitations and future work

Our study findings should be considered accounting for several limitations. First, our study population and setting were limited to older adults who presented to the ED having experienced a fall; therefore, our results may not be transferable to other populations or settings. Further, the demographic information we collected on the older adults included in our study may limit the generalizability of our results. We collected demographic information on the older adult's sex, age, education, marital status, living arrangement, self-rated health, and health literacy. These demographics are similar to those reported by other studies of older adults in the ED, see

Appendix G, yet may not provide sufficient evidence towards the generalizability of our results. Second, our findings may be limited due to the methods of data collection, specifically for the older adult interviews. The older adult interviews were conducted three to four days after the older adult was discharged from the ED, which often limited their ability to remember their ED discharge experience and answer questions. Third, as a secondary analysis, we may not have identified every work system interaction, dimension or common, unique, or divergent work system barrier and facilitator to collaboration at the time of discharge. Lastly, we did not identify which work system dimensions have the greatest impact on collaboration during the discharge process. Therefore, we are unable to propose which dimensions intervention should be designed to address to mitigate barriers and enhance facilitator to improve the discharge process.

In our study, we identified 16 work system barrier and facilitator dimensions to collaboration during the discharge process. Future work should explore different methods to identifying barriers and facilitators to collaboration during the discharge process. For example, future studies could use patient-centered observations of the discharge process to further our understanding of the barriers and facilitators to collaboration. Also, future work could engage older adults and ED nurses in an analysis of which barrier and facilitator dimensions are most impactful to collaboration during the discharge process. For example, a future study may use focus groups or survey methods with older adults and ED nurses ranking the identified dimensions from most to least impactful. These findings, along with those from our study could be used to engage older adults and ED nurses in HCD approach aimed at improving collaboration during the ED discharge process.

6.7 Conclusion

Our study provides valuable insight into barriers and facilitators older adults and ED nurses encounter during collaboration at the time of discharge. We report 16 dimensions for barriers and facilitators for all the work system elements and their interactions. Further, we highlight the importance of including multiple perspectives in the work system analysis of collaborative processes by identifying common, unique, and divergent barriers and facilitators. Overall, our findings highlight the importance of using a systems approach to understand how patients and clinicians collaborate during complex processes, such as the ED discharge process.

Chapter 7: Discussion

7.1 General discussion

Purpose of the dissertation

The purpose of my dissertation research was to use a systems approach to develop a deep understanding of older adult and ED clinician collaboration during the discharge process. To achieve this purpose, the practical aims of my dissertation research were to:

- Develop a detailed process map of the ED discharge process that includes information on the collaboration, patient work, and clinician work that occurs during the activities in the process.
- Define collaborative interactions as they occur in the discharge process, i.e., learning, coordinating, and communicating.
- Identify and compare the work system barriers and facilitators from the older adult and ED nurse perspectives to collaboration during the operational discharge process.

I used a staged secondary qualitative data analysis that integrated four data sources and resulted in a robust, contextualized understanding of collaboration during the ED discharge process.

Outcomes of the dissertation

My dissertation research resulted in both practical and theoretical outcomes. Practical outcomes of my research include: the ED discharge process map, definition, and examples for the three collaborative interactions: learning, coordinating, and communicating, and 16 work system barrier and facilitator dimensions and their definitions. These practical outcomes can be used as input to the design of ED discharge interventions to improve patient safety outcomes and experience. For example, practitioners can use the process map and how collaboration occurs during the discharge process to design interventions that target the type of collaboration that

occurs during specific discharge activities. For collaboration during the operational discharge, practitioners can use the identified dimensions of work system barriers and facilitators to collaboration to design interventions that remove barriers and enhance facilitators.

A theoretical outcome of my dissertation research is the development of the concept of collaboration in the complex ED discharge process. I developed the concept of collaboration by defining collaboration and collaborative interactions (i.e., learning, coordinating, and communicating), identifying work system barriers and facilitators to collaboration along 16 dimensions, and comparing the work system barriers and facilitators to find common, unique, and divergent perspective for older adults and ED nurses to collaboration during operational discharge. To my knowledge, this is the first study to define collaborative interactions (i.e., learning, coordinating, and communicating), identify work system barriers and facilitators to collaboration, and compare the work system barriers and facilitators for the different perspectives involved in collaboration.

My dissertation consisted of two interdependent studies, which can be found in chapters 5 and 6, that integrated four data sources to describe collaboration during the ED discharge process.

The objective of the first study was to describe in detail the ED discharge process including the collaboration that occurs between older adults and clinicians. To identify and map collaboration during the ED discharge process, I integrated data from 7 patient centered observations and 7 ED physician and nurse interviews and performed an inductive content analysis to identify the activities that occur during the ED discharge process and how collaboration, patient work, and clinician work occur during each discharge activity. In addition, I deductively analyzed the discharge activities identified as collaborative for collaborative interactions, as defined by Patel

et al. (2012). These methods resulted in a detailed process map that depicts how 14 activities and collaboration, patient work, and clinician work are distributed throughout the ED discharge process. I also defined the 14 activities that compose the ED discharge process. Lastly, I identified learning, coordinating, and communicating collaborative interactions, mapped them onto the ED process map, and produced comprehensive definitions. This study provides an overview of collaborative interactions during the ED discharge process but does not give a detailed description of how the work system affects collaboration, i.e., work system barriers and facilitators to collaboration. I pursued this objective in the second study.

The objective of the second study was to identify how the work system affects the collaboration that occurs between older adults and emergency department (ED) nurses during the operational discharge process; further, to compare how the multiple perspectives involved in the collaborative work perceive the work system barriers and facilitators to the operational discharge process. I used a staged qualitative deductive and inductive content analysis of 15 older adult and 10 ED nurse interview transcripts. Through this analysis, I identified and defined 16 dimensions of barriers and facilitators to collaboration during the operational discharge from the perspective of older adults and ED nurses. In addition, I compared older adult and ED nurse perceived barriers and facilitators to collaboration, identifying common, unique, and divergent perspectives.

7.2 Theoretical contributions – SEIPS model and collaboration.

In SEIPS 2.0, Holden and colleagues (2013) distinguished three types of work that should be considered when using a systems approach: patient work, clinician work, and collaboration. Multiple studies have used a systems approach to understand patient work (Holden et al., 2015;

Holden et al., 2017; Ponnala et al., 2020; Werner et al., 2022) or clinician work (Carayon et al., 2005; Carayon et al., 2019; Gurses & Carayon, 2009; Hose et al., 2023; Kelly et al., 2019; Musuuza et al., 2019; Ngam et al., 2017; Werner et al., 2021; Wooldridge et al., 2020). Yet, to my knowledge, they are a paucity of studies that use a systems approach to understand health care collaboration or how all three types of work can occur in complex health care processes. Further, there are no studies that integrate and compare the patient and clinician perspective of work system barriers and facilitators to collaboration. My dissertation research used a systems approach (i.e., SEIPS) to identify and define 14 discharge activities and how collaboration, patient work, and clinician work occur throughout the complex ED discharge process. Further, I deductively identified and defined three collaborative interactions: learning, coordinating, and communicating and how they are distributed throughout activities in the ED discharge process. For one collaborative activity in the discharge process, operational discharge, I found 16 dimensions of work system barriers and facilitators to older adult and ED nurse collaboration and how these dimensions were perceived as common, unique, or divergent barriers and facilitators by older adults and ED nurses.

My findings point to a few key takeaways when considering collaboration in complex care processes. First, collaboration, patient work, and clinician work can co-occur in clinical settings; therefore, complex care processes need to be designed to support all three types of work. Second, for collaborative processes, both the patient and clinician perspectives need to be included to gain a complete understanding of work system barriers and facilitators to the collaborative process, i.e., to identify common, unique, and divergent perspectives. Lastly, collaboration in complex health care processes is distinct from conceptualizations of care coordination and teamwork. Care coordination requires interdependencies and includes activities such as

monitoring (Kianfar et al., 2019; Kianfar et al., 2014; Schultz & McDonald, 2014). Through my conceptualization of collaboration, monitoring is either an example of patient work or clinician work, as it does not require active and reciprocal engagement in joint activities between the older adult and ED clinician. For example, I identified the activity "ED physician communicates with PCP/specialist about follow-up", which is an example of a monitoring activity that is not collaborative. In addition, my definition of collaboration is distinctly different than the concept of teamwork. Teamwork has been conceptualized as a three-pronged approach that includes communication, coordination, and cooperation (Salas et al., 2008). One of the three prongs of teamwork, cooperation, is often described as the motivation to maintain the team, trust, and cohesion (Salas et al., 2008). My results show how collaboration can involve a lack of cohesion, such as when the older adult and ED nurse identified unique or divergent work system barriers and facilitators.

Overall, I found that using the SEIPS model to understand collaboration resulted in a complex overlap of the older adult and ED nurse work systems, see figure 6. When the two work systems come together (i.e., collaboration), it results in common, unique, and divergent work system barriers and facilitators, which influence collaboration (e.g., how older adult and ED nurse engage in the collaborative interactions of learning, coordinating, and communicating), which feeds into the patient safety outcomes and experience of the older adult. The identification of unique and divergent work system barriers and facilitators is evidence towards two distinct work systems (i.e., the older adult's work systems and the ED nurse's work system), which come together during the collaborative process, rather than one joint work system which they both work within. Unique work system barriers and facilitator may be barriers and facilitators experienced to patient work in the older adult's work system and clinician work in the ED

nurse's work system. Divergent work system barriers and facilitators may be an instance where barriers and facilitators are experienced in the individual patient and clinician work systems but diverge from each other because they interact during the collaborative process. To recapitulate, during collaboration, the work systems of the older adult and the ED nurse come together, and a barrier (or facilitator) experienced in the older adult's work system diverges from a facilitator (or barrier) experienced in the ED nurse's work system. For example, I found that older adults reported a sufficient amount of time (i.e., facilitator) in their work system when collaborating with the ED nurse during operational discharge, whereas ED nurses reported insufficient time (i.e., a barrier) in their work system.

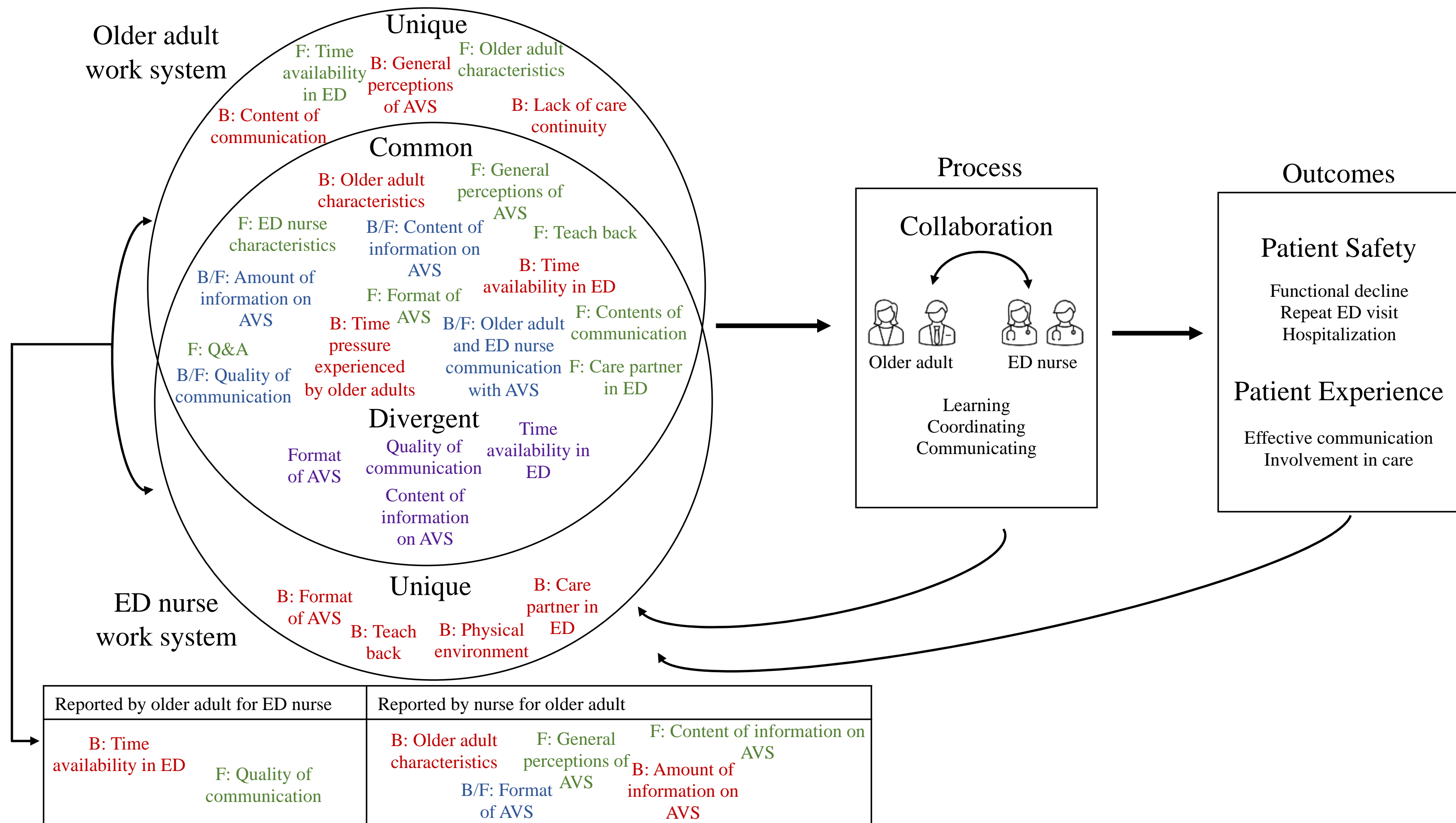

Figure 6. Adapted SEIPS model for older adult and ED nurse collaboration during the ED discharge process (Carayon et al., 2006; Carayon et al., 2020; Holden et al., 2013).

7.3 Practical contributions – implication for the design of ED discharge interventions. Interventions designed to target an older adult's care transition out of the ED, or the ED discharge process often result in meagre improvements to patient safety outcomes and experience, which may be because most studies do not have a deep understanding of the ED discharge process and older adult-ED clinician collaboration. For example, most studies only identify a couple of work system barriers and facilitators that are experienced in the process (see tables 3-6 in Chapter 2). The results of my dissertation research provide a systems understanding of collaboration during the ED discharge process. The results of my dissertation research can be used by practitioners as a starting point to their own analysis of collaboration in different contexts (e.g., primary care), patient populations (e.g., pediatrics), or care processes (e.g., diagnostic process). In addition, my results should be considered by practitioner as input into the design of ED discharge interventions. Table 23 outlines key findings of my work, their unique features, and design implications.

Table 21. Results and implications for ED discharge interventions.

Results	Features	Design implications
Discharge process map	• 14 discharge activities • Activities distributed throughout ED visit • Mix of temporal and non-temporal/repeatable activities • Collaboration (7 activities), patient work (1 activity), and clinician work (6 activities)	• Need to design interventions to address > 1 discharge activities and account for activities that may repeat. • Need to design interventions to support collaboration, patient work, and clinician work • Need to design interventions including all perspectives involved in discharge activities intervention will address
Collaborative interactions	• Three collaborative interactions: learning, coordinating, and communicating. • 2 discharge activities with learning – focused on older adult learning how to use new medical device.	• Need to design interventions to account for and support the type of collaborative interaction that occurs

	• 7 discharge activities with coordinating, including immediate coordination and coordination for after the older adult leaves the ED. • 6 discharge activities with communicating.	

16 work system barrier and facilitator dimensions to collaboration during operational discharge	• Work system barriers and facilitators for all work system elements and interactions
	• Common, unique, and divergent work system barriers and facilitators
	  o Unique
	    ▪ 5 barriers and facilitators for older adults
	    ▪ 3 barriers for ED nurses
	  o 5 divergent perspectives
		• Need to design interventions to mitigate barriers and enhance facilitators
		• Need to design interventions including all perspectives involved to account for unique and divergent perspectives

Overall, interventions to address the ED discharge process need to account for the complexity of the process, including the different activities, types of work (i.e., collaboration, patient work, clinician work), and the work system barriers and facilitators experienced by the different perspectives in the process.

7.3 Strengths

I used the concepts of qualitative validity and qualitative reliability to ensure rigor and trustworthiness in my results.

Qualitative validity

Qualitative validity requires the researcher to check the accuracy or truth of their findings from the perspective of the researcher, participants, and research context (Creswell & Creswell, 2018; Devers, 1999). I ensured qualitative validity in my results through triangulation and member checking.

- Triangulation: I used data, observer, and theory triangulation to build qualitative validity into my research. Data triangulation is achieved through "the use of more than one

method of data collection" (Patton, 2002; Robson & McCartan, 2011). I used four different data sources that represented multiple perspectives (i.e., older adult, ED nurse, ED physician) that were collected using two different methods (i.e., semi-structured interviews, patient-centered observation). Data triangulation produced rich, contextualized results that allowed for a detailed description of the ED discharge process, how collaboration occurs during the discharge process, and the barriers and facilitators to collaboration during operational discharge. Observation triangulation involves "using more than one observer in the study" (Robson & McCartan, 2011). The data used in my study was collected by five researchers, as outlined in Table 23. Lastly, theoretical triangulation is defined as "using multiple theories or perspectives". In my research, I integrated the SEIPS models (Carayon et al., 2006; Carayon et al., 2020; Holden et al., 2013) and the concept of collaboration (Bedwell et al., 2012) to achieve theoretical triangulation.

Table 22. Observer triangulation - researchers involved in data collection.

Data sources	**Researchers**
Initial ED nurse interviews	HF researcher 1, HF researcher 2 (co-PI)
Patient-centered contextual inquiry	HF researcher 1, HF researcher 3
WG3 evaluation – older adult interviews	ED research coordinator
WG3 evaluation – ED nurse interviews	HF researcher 4 (co-PI), HF researcher 5

- Member checking: Member checking involves taking the data analysis back to participants in the study to evaluate the results for accuracy, completeness, and perceived

validity (Creswell & Creswell, 2018; Patton, 2002; Robson & McCartan, 2011). During the development of the ED process map, I presented my results to multiple ED physicians, the research team, and an older adult care partner for feedback.

Qualitative reliability

Qualitative reliability ensures that the approach used by the researcher is consistent (i.e., reliable) (Creswell & Creswell, 2018). I achieved qualitative reliability by maintaining a descriptive audit trail of the data collection and analysis procedures (Creswell & Creswell, 2018; Robson & McCartan, 2011). As described in Chapters 5 and 6, multiple coders were used throughout the data analysis process to cross-check codes and ensure that there is no drift in the code definitions. Further, detailed codebooks were maintained and updated throughout the data analysis process, see Appendices F and G. These codebooks included the coding procedure, code definitions, documentation of decision made, and data analysis artifacts (e.g., table of emerging work system dimensions).

Quality considerations for secondary analysis

I took specific actions to ensure the quality of my findings for my secondary qualitative data analysis. First, I ensured that the original data collection methods were amendable to secondary analysis (Hinds et al., 1977). Second, I ensured that the objectives of the primary and secondary study were similar enough to permit secondary qualitative analysis while also having differences in scope and objective to necessitate the secondary study (Ruggiano & Perry, 2019). Further, I was able to remain sensitive towards the context of the primary study (Hinds et al., 1977) from my extensive involvement in collecting and analyzing data from the primary study.

7.4 Limitations and Future work

The findings from this dissertation should be considered with respect to several limitations. Limitations specific to each of the individual studies can be found in Chapters 5 and 6. In this section, I discuss overall limitations to the dissertation work and propose future work.

The results of my dissertation research filled a gap in the literature by providing a rich, contextualized description of collaboration during the ED discharge process. Yet, my results are limited because they do not go beyond description. For example, my results define and map 14 activities that may occur during the discharge process, see Chapter 5. Future studies could investigate the frequency in which these activities occur and common trajectories (e.g., the most common combinations of discharge activities, including their frequency (i.e., if they repeat) and order) through the discharge process. Such research may allow for tailoring ED discharge interventions to specific trajectories to improve patient safety outcomes and experience. Another limitation of my descriptive results is, despite identifying 16 dimensions of work system barriers and facilitators and which ones are common, unique, and conflicting, there is no evidence about which barriers most negatively affect the process and which facilitator most positively influence the process. Future studies could use focus group or survey methods to have older adults and ED nurse rank the work system barrier and facilitator dimensions, which could help to focus interventions on the most impactful barriers and facilitators.

Another limitation of my dissertation work was the scope. The scope of my study focused on the discharge process in the ED, excluding disposition decision making and any discharge related activities that occur after the patient leaves the ED (e.g., post-ED follow-up call). Such activities are intertwined with the ED discharge process and may affect what occurs during the ED

discharge process, specifically how older adults and ED clinicians collaborate. Further, the scope of my dissertation research only represents a small piece of the older adult's ED visit and an even smaller piece of their overall patient journey (Carayon et al., 2020). Future work could extend the scope of the research to begin to understand how collaboration occurs across the patient journey. For example, a future study may investigate how collaboration extends beyond when the patient leaves the ED into the follow-up call they receive from the ED once home and the care they receive at their PCP. This type of study may also allow for an analysis of how work system barriers and facilitators to collaboration can propagate throughout the patient journey.

Chapter 8: Conclusion

The ED discharge process is complex, and interventions designed to improve the process often fall short in affecting patient safety outcomes and experience for older adults. Using a systems approach (i.e., SEIPS model), I identified 14 discharge activities that are distributed throughout the ED stay and found that collaboration, patient work, and clinician work co-occur during the discharge process. Collaboration includes learning, coordinating, and communicating interactions. During one collaborative discharge activity, operational discharge, I identified 16 dimensions of work system barriers and facilitators to collaboration from the older adult's and ED nurse's perspectives. Further, older adults and ED nurses report common, unique, and divergent work system barriers and facilitators. The findings of my research highlight the importance of using a systems approach that includes multiple perspectives to understanding collaboration in complex care process. My results can be used my researchers and practitioners as a starting point for the analysis of collaboration in their own context, patient population, or care setting or as input into the design of interventions for the ED discharge process.

Appendix A: Secondary qualitative data analysis typologies

Thorne (2013) Typology for secondary qualitative data analysis (adapted from Beck (2019)

Name of approach	Description
Analytic expansion	Use of primary study dataset to ask a new question that had not been envisioned in the primary study.
Retrospective interpretation	Type of analytic expansion completed after primary study results have been published. Opportunity to expand or further develop aspects of the primary data or to correct findings from the primary study.
Armchair induction	Reuse of data by theoretical scholars to produce findings different than those of the primary researchers
Cross-validation	Confirms or discounts thematic conclusions from primary study across multiple datasets. Provides a mechanism to move beyond primary study sample and context to make a more global claim.
Amplified sampling	Confirmation across distinct study contexts and populations and expansion of meaning by means of a wider lens.

Hinds et al. (1977) Typology for secondary qualitative data analysis (adapted from Beck (2019)

1. Difference in unit of analysis from primary study
2. Subset of data analyzed from primary study for a more focused analysis
3. Reanalyze a portion or the entire primary study data to examine a concept not addressed in primary study.
4. Data from an existing qualitative study is used as a data source to further define a new study's methodology and data collection.

Heaton (2008) Typology for secondary qualitative data analysis (adapted from Beck (2019)

Name of approach	Description
Supra analysis	Goes beyond focus of primary study to examine new empirical, theoretical, or methodological questions.
Supplementary analysis	A more in-depth analysis of an emergent issue or aspect of the data that was not sufficiently addressed in the primary study.
Reanalysis	Reanalysis of primary study data to verify or corroborate primary study results

Amplified analysis	Combination of data from two or more primary studies for comparison or larger sample size
Assorted analysis	Combination of secondary analysis of data with primary study data

Appendix B: PSLL Problem analysis phase – ED physician and nurse interview guide

Interview Guide:
Disposition Decision-Making and Care Transitions of Older Adults

Date of interview: ____
Time of interview: Beginning: ____________ End: ________________
Total duration of interview: ____________________
Interviewers (circle initials): PC MS PH NW RZ other
Interviewee service: ____________________
Interviewee role: ______________________
Disposition decision-making: Fall / UTI (See Schedule)
Transition: ED -> Home / SNF / Hospital / Other

Thank you for being willing to be interviewed for this AHRQ-sponsored research project!

We are interested in designing a system of care that supports the safe journey of older adults, meaning *adults over age 65,* after ED presentation. We will focus on two aspects:

- The disposition decision-making process, how patient safety plays a role in this process, and what can be done to improve this process for older adults, and
- The actual transition from the ED to home, hospital or SNF, what factors play a role in the transition, what does that mean for patient safety, and what can be done to improve transitions for older adults.

Throughout this interview we encourage you to **provide examples** of cases you have faced. This will help us understand your thought process and how you make disposition decisions. When you talk about specific examples, please **do not use any name or other identifiable information**.

The interview will take about 45 minutes: 20 minutes for the disposition decision-making questions and 20 minutes for the questions about the transition.

Do you have any questions before we begin? Is it okay if I audio-record?

General questions

- How long have you worked as an ED nurse?

- How long have you worked at this ED?

1. Disposition decision-making questions

- We are interested in understanding – from your perspective – what is done for disposition decision-making for older adults from the ED to either their home, the hospital, or to a skilled nursing facility.
- We would like you to recall a memorable case of an elderly patient with a diagnosis of fall/UTI.
- Could you please summarize the case of this older adult and the process for making the **disposition decision** for this patient?

- *If you cannot think of a specific case, please think of disposition decision-making for older adults with fall/UTI in general, and tell me process occurs in making the decision to discharge to home, SNF, or hospital admission.*

- How did you make the decision for the disposition?

- What are the most important factor(s) in this process?
    - How does patient frailty and/or cognitive impairment impact the disposition decision? Did these play an important role for you?
    - How did results of tests, studies, and/or the physical exam influence your disposition decision?

- What is the patient's role in the disposition decision-making process?

- What makes the disposition decision-making process difficult?

- What makes it easy(er)?

- What system factors made it easy/difficult to make the decision?
    - Do you use the blue envelope system?

        - What do you like/what is useful about the blue envelope?
        - What do you not like about it?
        - How could the blue envelope process be improved?

- Do communication and coordination play an important role in the disposition decision-making process, or is it an individual decision?

- What factors play an important role in a ***safe disposition*** from the ED for older adults?

- **For falls:**
    - In the case that you were describing, did you do a fall risk assessment?
        - If yes, can you tell me more about it?
        - If no, can you tell me why? When is a fall risk assessment useful?

    - Did risk of venous thromboembolism influence your decision? If so, how? Does it always?

    - Did patient medications influence the disposition decision? If so, how?

    - What can be done to prevent patient safety issues such as multiple falls?

- **For UTI:**
    - What do you think can be done to prevent diagnostic errors from over-diagnosing or missed tests?

    - In the case that you were describing, to your knowledge, did a pharmacist perform a medication review?
        - If yes, can you tell me more about it
        - If not, can you tell me why it did not happen in this case?
    - What do you think can be done to prevent *inappropriate/unnecessary* antibiotics?

- What could further be done to improve the disposition decision-making process?
  - What solutions do you think could help?
  - For example:
    - Would standardization of the process help? Or is this not possible?
    - Can health IT play a role?
    - Would a checklist help?
    - Would a visual aide for the patient be helpful?

- What can be done to prevent re-admissions to the ED for falls/ UTIs by making changes to the disposition decision-making process?

2. Transition questions

- Now we want to talk about what happens after the disposition decision has been made.
- We are very interested in understanding – from your perspective – what is done for a **transition of care** between the ED to another hospital department, to a skilled nursing facility (SNF), or to the patient's home (or assisted living) once the decision about disposition is made.
- Again let's talk about an older patient entering the ED due to a fall/UTI. We can use the same patient that we used for the disposition decision-making process, if you want.

- Can you describe this transition and what you do in the transition?

- What can you tell me about communication and coordination in the transition process?
  - With whom do you communicate, in the ED and/or in the receiving unit?
  - Do you try and coordinate care, for example with the receiving physician (in hospital, primary care, or physician in SNF)

- What is the patient's role in the transition?

- What technologies/tools are used in the transition (HealthLink/written documents)?

- How is the blue envelope used in the transition?

- What do you do with pending lab tests and images?
  - [UTI only] What do you do if the urine culture does not confirm the infection or the type of antibiotic prescribed after the patient has left the ED?

- What factors play an important role in a safe ***transition*** for older adults leaving the ED with a fall/UTI?
  - What are barriers to a safe transition?
  - What are facilitators?

- What can be done to ***improve the transition*** process?
  - What solutions could help the transition?
  - What system factors hinder transitions?
  - How could technologies (e.g., health IT) be used/improved to help the transition?
  - How could standardization of the process play a role?
  - Could checklists play a role?
  - Would a visual aide for the patient be helpful?

- What can be done during the transition to prevent re-admissions to the ED for falls/ UTIs?

- From your perspective, what is a good transition?
  - What are the elements that are needed?
  - What system factors help with the transition?

- Is there anything else that we should think about with regard to disposition decision-making or transitions for older patients in the ED?

- Do you have any questions for us?

Thank you for your participation!

[hand interviewee NIH demographic sheet]

Appendix C: Patient-centered contextual inquiry form

Patient ID #: _______________

Start Time:

Came from: Home SNF Other

Observer: MS RZ PC PH NW

Day: Weekday Weekend

End Time:

Condition: Fall UTI

CDU? Y N

Disposition: Home SNF Hosp Other

#	Time	In/out	**Who** talks to **whom** about **what?**	Tools & Technologies (including blue envelope)	Questions
1					
2					
3					
4					
5					
6					
7					

Observation interrupted? Y N
Reason:
Blue envelope present?
Y N N/A
Suspected UTI only - Final diagnosis of UTI? Y N N/A
Notes on physical environment:

Family/friends/caregiver present? Y N

Who present:

Activated POA? Y N

POA present? Y N N/A

[END OF OBSERVATION - GRAB SIGN ON PATIENT DOOR]

Follow-up interview

Patient ID #: ____________

Attending physician

Did you discuss disposition for this patient outside of the patient room? If so, with who? What was discussed?

Additional questions:

Notes:

Patient Safety Insights/Opportunities

Patient

Questions:

Notes:

Appendix D. WG3 intervention – Patient interview guide

Interview questions

I want you to think about when the nurse came in to talk to you about your discharge from the emergency room and the things you need to do to care for yourself or to watch for once you got home. Can you describe for me what was helpful to you about the conversation you had with the nurse?

Now I want you to think about anything that you thought was not helpful when talking with the nurse about the discharge. Can you describe for me what was not helpful to you?

Probe:

- How can we improve the conversation between patients and nurses about discharge instructions?

The nurse handed you the After-Visit-Summary sheet called the AVS. The AVS has information about what to do after your visit to the ER and what to watch for once you get home. What do you think about the AVS that you received?

Probe:

- If the patient states- they threw the papers away or they don't remember getting any papers- follow with:
    - Can you say more about throwing the paper away?
    - What would help you in understanding the importance of the papers?
- What about how the information presented in the AVS- was there too much information or not enough information? Can you say more about that?
- How about finding the information you think you needed? Was it quick and easy or confusing? Can you say more about that?
- How do you think we could improve the AVS we give patients when they leave the emergency room?

Sometimes emergency room nurses call patients the next day. Did you get a call from the nurse the next day? If no- see below. If yes follow with: Can you tell me what you thought about getting a phone call?

Probes:

- The nurse may have asked you if you had any questions about your discharge instructions. Can you tell me if that was helpful to you? Can you say more?
- The nurse may have also asked if you made your follow up appointment with your doctor. Was that helpful to you? Did you experience any problems getting a follow up appointment made?

- Sometimes the nurse reminds patients what to watch for and when to call their physician. What do you think about that? Was that helpful to you?

If the patient states they did not get a phone call follow with:

- Would it have been helpful to you to get a call the next day?
    - You will most likely get a yes/no response- follow with- Can you say more about that?

Appendix E. WG3 intervention – ED nurse interview guide

Interview with ED nurses – Post implementation of redesigned AVS and tips for follow-up call

Objective:
The objective of this qualitative data collection is to gather information from ED nurses regarding the redesigned AVS and the tips embedded in the EHR about the follow-up call.

Interview questions:
On May 4, we launched a new design of the AVS. [show them the revised AVS]

What do you think of this **redesigned AVS**? What is it about the redesigned AVS that you like? What is it about it that you dislike?
Probes:

- How does it fit in your workflow? Does it fit well/not well when you talk with the patient?
- What impact does it have on patient comprehension of discharge instructions? What is your perception of its impact? Positive or negative impact? Why?

Tell us about **teach back** when you give discharge instructions to patients.

- Are you able to do teach back?
    - Yes, no. why? Why not? Barriers and facilitators?
- What do you think of the teach back method? Pluses? Minuses?

Do you ever do call-backs with patients once they are back at home?
As part of the implementation of the redesigned AVS, we also added **tips for the call-backs** that you conduct with ED patients. [show the tips in the EHR]

What do you think of this set of tips? Helpful? Not helpful?
Probes:

- If not sure what tips we are talking about, share a screenshot. Ask if they had not seen them before.
- How do you integrate the tips in your call-backs?

Appendix F. Research Question 1 Codebook

Coding for the Discharge Process and Collaboration

Research Question

What activities compose the ED discharge process and how does collaboration occur between older adults and ED clinicians during the ED discharge process?

Objectives

1. To code the (1) initial ED nurse and physician interview data and (2) patient-centered observation data for instances of the ED discharge process to create a process map.
2. To code the (1) initial ED nurse and physician interview data and (2) patient-centered observation data for collaborative work and integrate into the ED discharge process map.

Definition of Key Terms

Care transition: "a set of actions designed to ensure the coordination and continuity of health care as patients transfer between different locations (e.g., ED to home)" (Coleman, 2003; Coleman & Boult, 2003)

Discharge: a care transitions that is temporally distributed throughout an older adults ED visit

A report by the Agency for Healthcare Research and Quality identified three characteristics of a high-quality ED discharge process:

1. communication and education with patients (e.g., diagnosis, prognosis, treatment plan, disease trajectory),
2. information and support for post-ED care (i.e., discharge planning) (e.g., medication management, use of medical devices, wound care, follow-up), and
3. coordination of post-ED care (e.g., appointments with primary care physicians) (Boonyasai et al., 2014)

Discharge instructions: a document given to the patient and care partner during the discharge process that often includes important clinical information and education, such as diagnosis, summary of care received in the ED, post-ED care instructions, medication, and follow-up (Taylor & Cameron, 2000a)

Time of discharge: the period when the ED nurse gives the older adult their discharge instructions and has the discharge conversation, occurring after the disposition decision is made and before the older adult leaves the ED.

During the time of discharge, the discharge instructions and conversation with the ED nurse may include discussion around the three four pillars of care transitions (Coleman et al., 2006; Coleman et al., 2004):

1. medications and medication management,

2. follow-up with primary care physician or specialist,
3. “red-flag” reasons to return to the ED.
4. In addition, specific to the ED time of discharge, is discussion of home care (e.g., wound care, use of medical tool/device)

Patient work: Work that “involves the active engagement of patient, family caregiver, and other non-professional.” and may include clinically recommended activities (e.g., medication management, wound care) and coordination activities (e.g., coordinating transportation or appointment). (Holden et al., 2013)

Professional work: work where “the primary agent is a professional or team of professionals, with minimal active patient, family caregiver, or other non-professional involvement.” (Holden et al., 2013)

Collaboration (i.e., collaborative work): “an evolving process whereby two or more social entities actively engage in joint activities aimed at achieving at least one shared goal.” (Bedwell et al., 2012). Collaborative work is further defined by four collaboration interactions (1) learning, (2), coordinating, (3) communicating, and (4) decision making.

Methods

We first used structural coding (Saldaña, 2016) to extract large excerpts informed by the definitions of discharge, discharge instructions, and time of discharge.

We then conducted an inductive content analysis (Elo & Kyngas, 2008) on the extracted excerpts to identify components of the discharge process and map them onto a process map (Figure 1). Each extracted excerpt could be coded for one discharge activity. If an excerpt had multiple discharge activities, the excerpt was split. See Table 1 for the identified discharge activities, definition, and examples from the data.

Each extracted excerpt was coded for patient work, professional work (i.e., ED clinician work), and/or collaborative work.

For the excerpts that were coded as collaborative work, we deductively coded the components of the ED discharge process for the collaboration as identified by Patel, Petit, & Wilson:

- learning,
- coordinating,
- communicating, and
- decision making

See Table 2 for the definition of the four types of collaboration and examples from the data.

The excerpts coded for the four collaboration interactions were then split and each type of collaboration was inductively analyzed. See Tables 3- 9 for the types of collaboration, there definition, and data examples for the 7 collaborative discharge activities. Further detail for two

types of collaboration, learning, and coordinating, are further described in Table 10 and Table 11, respectively.

Coding instructions:

1. In Dedoose, code data source for instances of discharge, including conversations about the discharge instructions or the time of discharge.
    - For exclusion criteria, see Table 12.
2. Export excerpts to Excel.
3. Code for the discharge activity in column H "Discharge activity" of the Excel document using the drop-down list of abbreviated codes. For codes, definitions, and examples see Table 1.
4. Write a summary of the excerpt that describe who (e.g., ED nurse, patient, ED physician) is performing what tasks (e.g., communicating, removing patients IV,) using what tools and technology (e.g., arm sling) in column titled "Summary" of the Excel document.
5. Code for patient work, ED clinician work , and collaboration.
    - In columns titled "Patient work", "ED clinician work", and "Collaboration" code a 1 if the specified type of work occurs in the excerpt and a 0 otherwise.
6. If the excerpt includes an instance of collaboration, code for type of collaborative interactions
    - In columns titled "Learning", "Coordinating", "Communicating", and "Decision making" code a 1 if the specified type of collaborative work occurs in the excerpt and a 0 otherwise.
    - To the right of each type of collaborative work is a column "Description". If the type of collaborative work occurred, include description of the collaborative work. The descriptions can be pulled from the summary in column "Summary", excluding any part of the "Summary" that is not collaborative work.
    - If more than one type of collaborative work occurs in an excerpt, create a new row, and copy the excerpt, coding for the type of collaborative work as described above. This will result in multiple rows with the same excerpt for each type of collaboration identified.
7. Create a new tab in the Excel document for each type of collaboration (i.e., learning, coordinating, communicating).
8. Print each collaborative interaction excel tab, cut out the excerpts and their coding, and perform affinity diagraming to begin to identify categories within the collaborative interaction.
    - For results, See Tables 3-9 for results for the 7 identified discharge process activities with collaboration and Tables 10 and 11 for further description of learning and coordination categories, respectively.
    - Note: There is no table for communicating categories because communication was inherently described in Table 1.
9. After preliminary collaboration categories have been identified, code for those categories in the respective Excel tab.

10. Create the discharge process map (Figure 1) using the activities described in Table 1 and the collaborative activities described in Tables 3-9.

Table 1. Activities in the discharge process codes and definitions.

No.	Activities in the discharge process (abbreviation in Excel)	Definition	Examples
1	Patient and care partner plan for home care (Pt & Cp home care)	When patients and care partners start to plan for how to care for the patient after discharged from the ED, which may include: • who will care for patient at home (family, friends, RN), • how to care for the patient at home (e.g., toileting, medications), • what assistive/medical devices the patient will need at home • follow-up care (e.g., notifying PCP patient was seen in ED, scheduling follow-up appointments with PCP/specialists)	• The daughter said that if the patient was sent home, she would stay with her overnight in her house. (PSLL17) • The family said that they were most concerned about knowing when to get the patient her medication once she got home. (PSLL03) • The daughter asked if it would be possible for the patient to go home with the PUREWICK. The son that someone would come in and give them options about what the family could do over the next few days. (PSLL17) • The son called the patient's PCP office and explained the patient's situation to them. (PSLL17) • The family began to speculate about the patient's injuries and talk about what they would do if the patient sustained certain injuries. Specifically, the family talked about if the patient had a damaged or broken knee they would be particularly concerned because the surgeon that did the patient's knee replacements has since moved away …the family indicated that if there was an issue with the patient' knees, they would consider flying to NC to see this surgeon. (PSLL03) • The wife said the patient needed to see an ortho surgeon in 2 weeks. The patient and wife were both surprised and said they never heard anyone mention that they need to see an orthopedic surgeon. The wife said it's not necessary and the patient was concerned on getting an appointment in such short notice. (PSLL21)

2	EM physician talks with patient/care partner about being discharged home (ED physician d/c home)	When an ED resident or attending explains that the patient will be discharged home and talks with the patient and care partner about : • Description of patient's diagnosis (e.g., result of scans, tests) • How to care for patient at home (e.g., wound care, monitoring vitals) • How to seek follow-up care (e.g., visit PCP or specialist) • Medication management (e.g., where to pick up medications, how to take mediations) • Red flags (e.g., when to return to the ED)	• ED physician explains diagnosis and discusses care plan with patients, including: sling, pain medication, nausea medication, PCP follow-up in 2 weeks, red flags for return to ED or early visit to PCP, home remedies (i.e., ice, elevation). (Summary: PSLL03)
3	Specialist physician talks with patient/care partner about being discharged home (Specialist physician d/c home)	When a specialist physician (e.g., orthopedic surgery resident, surgery fellow) explains that the patient will be discharged home and talks with the patient and care partner about: • Description of patient's diagnosis (e.g., results of scans, tests) • How to care for patient at home (e.g., wound care, monitoring vitals) • How to seek follow-up care (e.g., visit PCP, specialist, or physical therapist)	• "The orthopedic surgical resident talked to the patient about the next steps with respect to care for his shoulder including the placement of the sling, pain control and the integration of exercises over the next few days... The orthopedic surgical resident said that the patient would come back to the trauma clinic in two weeks to make sure that everything is healing in the way one would expect; the orthopedic surgical resident said that someone from the clinic would call in the next few days to set up that appointment." (PSLL04) • Surgery fellow asks patient and care partner if they want to stay and complete a stomach and chest scan to ensure patient doesn't have internal bleeding from blood thinners, Pt replies no. Surgery fellow explains red flags and that patient should return to ED if they notice any red flags. The

		• Medication management (e.g., where to pick up medications, how to take mediations) • Red flags (e.g., when to return to the ED)	patient asks about wearing the sling, the surgery fellow says that it is mainly for comfort. (Summary: PSLL21)
4	EM nurse talks with patient/care partner about being discharged home (ED nurse d/c home)	When an ED RN explains that the patient will be discharged home and talks with the patient and care partner about: • Description of patient's diagnosis (e.g., results of scans, tests) • How to care for patient at home (e.g., wound care, monitoring vitals) • How to seek follow-up care (e.g., visit PCP, specialist, or physical therapist) • Medication management (e.g., where to pick up medications, how to take mediations, helping patient navigate to ED/hospital pharmacy) • Red flags (e.g., when to return to the ED)	• The patient inquired about one of her medications (Tramadol) and RN3 warned her to never take it when she's alone. (PSLL19)
5	Social worker informs patient/care partner about community resources (SW	Involvement of social worker in discharge process, which may include: • Social worker providing information or discussing	• The social worker asked if the family had any questions about community resources. She also asked about the patient's plan of care. The son said that the plan of care hadn't yet been determined but that he hoped the patient would be kept overnight for observation. The social worker said that the son should mention that to the care team and

	community resources)	community resources with patient and care partner.	said that they might be able to accommodate that request. The social worker recommended that the family seek a senior care navigator through A Place for Mom as they would know better than she about senior care options. The social worker said that she would bring over a packet of resources and said that if they had any questions, they could ask. (PSLL17) I know on certain occasions, especially in traumas, you know, like falls, social work can do that. Social work communicates with family here if they have further questions or things like that. Or even just like support, you know, if it's a really bad fall that maybe the patient is not doing well, social work is a good supporter, just being there for family and things too. (ED nurse JZ)
6	EM nurse and/or social worker helps patient coordinate transportation home from ED (ED nurse/SW transportation)	When the ED nurse or social worker helps patient coordinate public (e.g., taxi, bus) or private (e.g., care partner) transportation home from the ED	• "Sometimes hotels offer like cab rides, you know, to and from the hospital. Social work, for example, might help us arrange that." (ED nurse JZ)
7	EM care team members prepare patient for departure from ED (Preparing for departure)	Activities performed in the ED to prepare patient to depart, which may include: • Gather patient's personal affects • Helping patient dress • Removing IV, pulse/oxygen monitor, etc. • Bringing in wheelchair, providing directions to help patient exit ED • Helping patient perform oral challenge, road test, and toileting.	• ED physician explains that the patient will need to complete a road test and oral challenge. (Summary: PSLL03) • ED nurse says she will remove patient IV and bring in the discharge instructions (Summary: SPLL19)

8	EM care team members communicate and coordinate patient discharge (ED care team C&C d/c)	Activities performed by the ED care team to coordinate the patient's discharge from the ED	• The resident physician and the attending physician. The ultimate decision is made by the attending physician no matter where discharge is to. You know, if it's home, a facility, another facility, hospital-wide, I mean, or us here, the attending physician always has the final say. The residents work pretty closely with us. Sometimes social work will be involved depending on patients' specific cases, not always, but they are usually a good helpful resource. (ED RN JZ) • "ED nurse asks ED physician to clarify patient question on AVS." (EDAtt AH)
9	Specialist physician communicate and coordinate patient discharge and follow-up with ED care team members (Specialist physician C&C d/c w/ ED care team)	Activities performed by the specialist physician to coordinate the patient's discharge with the ED care team	• "The orthopedic surgical resident then said that he would go check in with the ED team about getting the patient sent home." (PSLL04)
10	ED physician communicates with PCP/specialist about follow-up (ED physician f/u)	Communication by the ED physicians with the patient's PCP or specialists about post-ED follow-up care, which may include: • The tools and technology they use The information they provide	• "Well, we in basket, sometimes, the PCPs." (EDAtt AH)
Operational discharge			
11	ED physician prepares the discharge	Activities performed by the ED physician to prepare the patients after	• "And then it's a lot of writing it up, right, I'm going to write up my note with things I'm worried about, write up the AVS, the discharge instructions" (EDAtt MS)

	instructions (ED physician d/c instructions)	visit summary (AVS), which may include: • The tools and technology they use • The information they provide • Sending e-prescriptions to the pharmacy or preparing written prescriptions	• "I guess our diagnoses are important, and then we can enter info sheets on the condition and the diagnosis that are templated out… and these are all designed for emergency physicians to use. I still see people pecking away, typing, trying to type out these instructions that are literally in the template, so that just drives me nuts. But there's just not a good habit of using these templates that we designed, or not we, but there's a company that designs them. " (ED Att MP) "in the discharge paperwork, the physicians will write like, your urine culture is pending. If there's any changes that need to be made, we will call you in 48 hours." (ED RN DB)
12	ED nurse documents discharge process in EHR (ED nurse d/c EHR)	• Activities performed by the ED RN to document the patient's discharge process in the EHR, including what information they document.	• "Yeah, we have like a discharge tab, you know, that just says, discharged. And then we'll put, you know, if they're going home, did we give them written and verbal instructions? Who gave those instructions? You know, was it considered minimal, moderate, or complex discharge instructions? Did they have a prescription they went home with? If we gave them a strong prescription to go home with for pain medicine or something like that, did they get the safety handout that explains a drug? With falls, if they are hurting, you know, they might go home with a pain medicine or something like that. • And then how they left, you know, did they walk out? Did they go by wheelchair? Who took them? You know, did they go on oxygen? Did they go on a cardiac monitor?" (ED RN JZ)
13	EM nurse augments EM physician discharge instructions (ED	When the ED nurse adds additional information to the discharge instructions after they have been written by the ED physician. May	• "So we have Health Facts for You that we can sometimes attach, from, nurses will do that part." (EDRN CM)

	nurse aug. d/c instructions)	include added pre-formatted information sheets.	
14	EM nurse talks with patient/care partner about discharge instructions (ED nurse d/c instructions)	When the ED RN brings in the print after visit summary (AVS) and discusses it with the patient and/or care partner	• RN3 gave the paper instructions to the patient and reviewed the following: You were seen for a fall You got a CT scan that revealed no injury You were given Tylenol You are to see your PCP within 2 days These are your most recent vitals • RN3 encouraged the patient to bring these documents with her when she goes to her PCP so she could show her most recent blood pressure. (PSLL19)

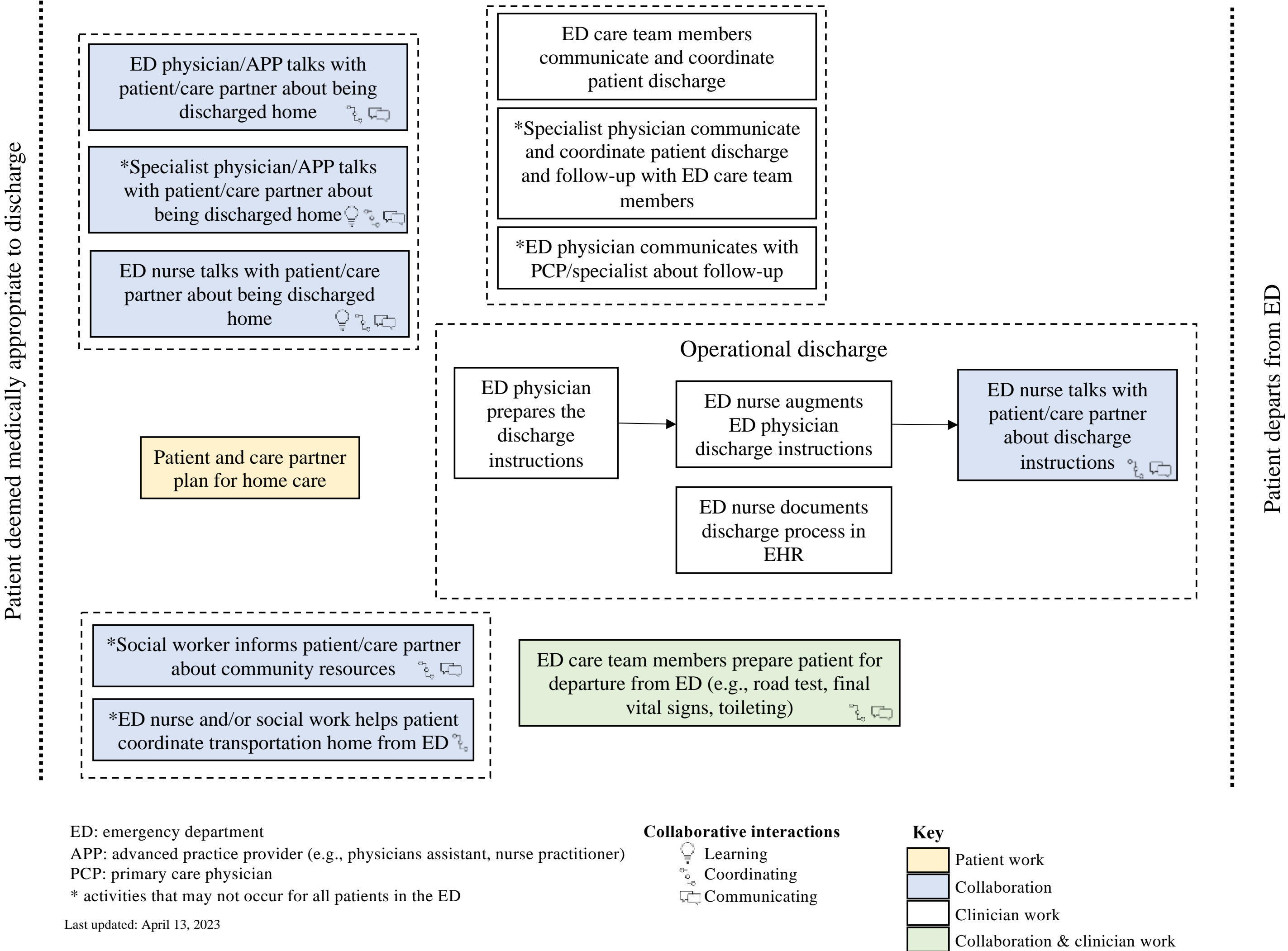

Figure 1. Within ED discharge process map.

Table 2. Collaborative interactions codes and definitions.

Collaborative interaction	Definition	Examples
Learning	The process of acquiring skills, behaviors, knowledge, or attitudes motivated by the need to know the information (Innot & Kenneday, 2011)	• "The orthopedic surgical resident talked to the patient about the next steps with respect to care for his shoulder including the placement of the sling" (PSLL04)
Coordinating	"Care coordination is the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient's care to facilitate the appropriate delivery of health care services. Organizing care involved the marshalling of personnel and other resources needed to carry out all required patient care activities, and is often managed by the exchange of information among participants responsible for different aspects of care." (Schultz & McDonald, 2014) Core elements of care coordination: (1) multiple participants, (2) interdependence, (3) knowledge of roles and resources, (4) information exchange (i.e., communication), (5) articulation of a goal (Schultz & McDonald, 2014)	• ED RN tells pt to follow-up with PCP. Pt asks if PCP will have access to ED visit in EHR, ED RN says yes. (Summary: PSLL19) • ED RN asks pt if she would like to use a wheelchair to exit ED, pt says yes. ED RN brings wheelchair to pt room. (Summary: PSLL19) • ED nurse reminds patient to bring AVS to follow-up appointment with PCP in 2 days to show PCP blood pressure results. (Summary: PSLL19) Patient asks about a cab ride back to urgent care to pick up her car. ED nurse recommends patient call phone number on her insurance car to coordinate transportation. Patient explains that she doesn't have her insurance card and ED nurse says they will have social work help her in the ED lobby. (Summary: PSLL27) • ED resident tells patient diagnosis and recommends patient follow-up with ophthalmologist within a week and

		says he will include the phone number in the AVS. ED resident also notes that ophthalmologist will be able to see patient's EHR and that she was seen in the ED, which should help patient get a short notice appointment. (Summary: PSLL27) • The social worker recommended that the family seek a senior care navigator through A Place for Mom as they would know better than she about senior care options. (PSLL17)
Communicating	Efficient, accurate, and precise exchange of information between at minimum two parties (e.g., patient, ED clinician) (Salas et al., 2008)	• ED physician explains diagnosis and discusses care plan with patients, including: sling, pain medication, nausea medication, red flags for return to ED or early visit to PCP, home remedies (i.e., ice, elevation). (Summary: PSLL03)
Decision making	"Collaborative deliberation whereby patients and clinicians consider the potential harms and benefits of various medical options to come to a mutual agreement on how to proceed, accounting for the patient's values, goals, and preferences" (Schoenfeld et al., 2018) Shared decision making is further defined as requiring four key characteristics: 1. Patient and physician are involved, 2. Both patient and physician share information,	N/A

	3. Both patient and physician work to build consensus, and 4. A decision is made and implemented. (Charles et al., 1997)	

Collaboration during activities in the ED discharge process

Table 3. Collaboration when the EM physician/APP talks with patient/care partner about being discharged home

Activities in the discharge process	**Learning**	**Coordination**	**Communication**

EM physician/APP talks with patient/care partner about being discharged home		**Follow up with PCP:** Coordinating a follow-up appointment with the patient's primary care physician
		• **Recommendation to follow-up with PCP**
		  ○ The resident said that the patient should plan to follow up with her PCP in 2 weeks, or sooner to make sure that everything is healing in the way it should. (PSLL03)
		• **Scheduling follow-up appointment with PCP**
		  ○ The family also said that they've tried to get through
			When an EM resident, attending, or APP explains that the patient will be discharged home and talks with the patient and care partner about :
			• **Description of patient's diagnosis (e.g., result of scans, tests)**
			• **Home care (e.g., wound care, monitoring vitals)**
			• **Medication management (e.g., how to take medications, medication side-effects)**
			• **Red flags (e.g., when to return to the ED)**
			  ○ The ED resident came into the room and told the patient that he for sure had a fracture and

		to the patient's PCP to get an appointment throughout the day since the fall but have not been able to get through. The ED resident told them to try again tomorrow and then left the room. (PSLL03) • **Follow-up treatment with PCP (e.g., having stitches removed)** o The ED resident told the patient to get the staples removed either at her PCP's office or urgent care in 10-14 days. (PSLL27) **Follow up with specialist:** Coordinating a follow-up appointment with the specialist physician • **Recommendation to follow-up with specialist physician** o He said that the patient needed to follow up with her ophthalmologist within a week. (PSLL27) • **Scheduling follow-up appointment with specialist physician** o He said that he would attach the number of the ophthalmologist in her discharge paperwork just in case. He said that the	that he would be in a sling for 4-6 weeks. … The resident told the patient that he should limit the amount of weight he bears in his hurt arm. The resident said that all of this information would be documented his discharge summary. The ED resident told the patient that he should come back if he has any numbness or major pain. The patient asked if he was going to be on pain meds and the resident said that the patient would be likely managing pain with over the counter medication, unless otherwise needed. The patient asked for a glass of water. The resident said that he would go get the patient a glass of water and get the discharge paperwork and get the patient fitted for a sling.(PSLL04)

		ophthalmologist should be able to see everything that was done in the ED today and get her in quicker. (PSLL27)
		  ○ The orthopedic surgical resident said that someone from the clinic would call in the next few days to set up that appointment (PSLL04)
		• **Follow-up treatment with specialist physician (e.g., MRI)**
		  ○ The attending said that the patient would go home and likely go to an ortho clinic and that that it would be possible that he would need to get an MRI there. (PSLL04)
		Medication: Coordinating how to access medications prescribed in the ED after patient is discharged home.
		• **Where/when to pick up medications and how to take**
		  ○ The ED resident reminded the patient about a medication she would need to take. The patient asked where she could get this medication. The ED resident asked which pharmacy the patient	

		preferred. The patient told her the name of her pharmacy, and the resident said that the patient should go get that medication tomorrow. The ED resident told the patient that she would need to take the medication two times per day and began to list the side effects of the medication (PSLL20)	

Table 4. Collaboration when the Specialist physician/APP talks with patient/care partner about being discharged home

Activities in the discharge process	**Learning**	**Coordination**	**Communication**
Specialist physician/APP talks with patient/care partner about being discharged home	Instances where the **specialist physician** helps the patient or care partner **learn how to use a new medical tool/device** (i.e., sling)	**Follow up with specialist:** Coordinating a follow-up appointment with the specialist physician • **Recommendation to follow-up with specialist physician**	When a specialist physician/APP (e.g., orthopedic surgery resident, surgery fellow) explains that the patient will be discharged home and talks with the patient and care partner about: • **Description of patient's diagnosis (e.g., results of scans, tests)**

	The orthopedic surgical resident talked to the patient about the next steps with respect to care for his shoulder including the placement of the sling (PSLL04)	• **Scheduling follow-up appointment with specialist physician**
		  ○ The orthopedic surgical resident said that the patient would come back to the trauma clinic in two weeks to make sure that everything is healing in the way one would expect; the orthopedic surgical resident said that someone from the clinic would call in the next few days to set up that appointment. (PSLL04)
			• **Home care (e.g., wound care, monitoring vitals)**
			• **Red flags (e.g., when to return to the ED)**
			  ○ The orthopedic surgical resident talked to the patient about the next steps with respect to care for his shoulder including the placement of the sling, pain control and the integration of exercises over the next few days (PSLL04)
			  ○ Surgery fellow said to call if anything feels strange and come in. Surgery fellow asked if UW was the closest ED to the patient? The patient said yes so the surgery fellow said the patient should come here if he notices anything strange. Surgery fellow said he thinks he will be fine but he wanted to talk about it in case. The patient asked about wearing a sling and the surgery fellow said he should wear it for comfort/pain but otherwise he doesn't need it. (PSLL21)

Table 5. Collaboration when the EM nurse talks with patient/care partner about being discharged home

Activities in the discharge process	Learning	Coordination	Communication

EM nurse talks with patient/care partner about being discharged home	Instances where the **EM nurse** helps the patient or care partner **learn how to use a new medical tool/device** (i.e., sling)
	
	• ED nurse 1 and ED nurse 2 came into the room to talk about arm mobilization exercises and how to operate the sling. (PSLL03)
	• "we make sure that they have a sling that, we show the spouse how, or the family member how
		Home Care: Coordinating who is going to help care for the patient once discharged home.
		• **Who is going to stay with the patient**
		  ○ Nurse 2 asked the family if the patient could either stay at one of their homes or if one of them would be willing to stay with the patient One family member offered to stay with the patient, and another offered for the patient to come to her house. (PSLL03)
		• **Who will be able to help with come care**
		  ○ "is there going to be another person there at home to help you get this guy's legs into bed? You know, because it's, again, elderly people are often going home with their elderly spouse and not necessarily a kid or a grandchild to help, so I usually just make sure that
			When an EM nurse explains that the patient will be discharged home and talks with the patient and care partner about:
			• **Description of patient's diagnosis (e.g., results of scans, tests)**
			• **Home care (e.g., wound care, monitoring vitals)**
			  ○ The son asked Nurse 2 about wound care and she recommended that the dressing be changed once per day and to avoid submerging the wound (e.g. in a bath). (PSLL17)
			• **Medication management (e.g., how to take medications)**
			  ○ Nurse 1 told the family that the patient likely fractured her arm and that the most likely scenario was that the patient would be discharged home in a sling with pain medication. (PSLL03)

	to place the sling or how to adjust the sling so that they have that education on how to help at home." (ED RN CM)	they have somebody else on backup." (ED RN CM)
		Follow-up with PCP: Coordinating a follow-up appointment with the patient's primary care physician
		• **Recommendation to follow-up with PCP**
		• **Scheduling follow-up appointment with PCP**
		  ○ "Our recommendation is that you follow through your primary care physician in two days. So if you could give them a call when you leave the emergency room to schedule that follow-up appointment, that would be great." (ED Nurse DB)
		Medications: Coordinating how to access medications prescribed in the ED after patient is discharged home.
		• **Wayfinding to ED/hospital pharmacy**
		  ○ The family was worried because it was around 4 hours before the patient would be going to bed and they still had not yet gotten the prescription filled. nurse 2 said that he would show	

		the family where the pharmacy is located. (PSLL03)	

Table 6. Collaboration when Social worker informs patient/care partner about community resources

Activities in the discharge process	**Learning**	**Coordination**	**Communication**
Social worker informs patient/care partner about community resources		**Coordinating** follow-up with **community-based resources** (e.g., A Place for Mom) • The social worker recommended that the family seek a senior care navigator through A Place for Mom as they would know better than she about senior care options. (PSLL17)	When a social worker **provides information or discusses community resources** with patient and care partner. • The social worker asked if the family had any questions about community resources. She also asked about the patient's plan of care… The social worker said that she would bring over a packet of resources and said that if they had any questions, they could ask. (PSLL17)

Table 7. Collaboration when EM nurse and/or social worker helps patient coordinate transportation home from ED

Activities in the discharge process	Learning	Coordination	Communication
EM nurse and/or social worker helps patient coordinate transportation home from ED		**Transportation:** Coordinating transportation **home from the ED** • "Social worker just might communicate, you know, like is this a person from out of state? Are they staying in a hotel? Sometimes hotels offer like cab rides, you know, to and from the hospital. Social work, for example, might help us arrange that" (ED RN JZ) • Nurse 3 asked the patient the best way to get her home. She asked if the patient drove. The patient said "no" and then asked if they had her daughter's phone number… Nurse 3 didn't answer the patient's question and instead verified the patient's daughter's phone number. Nurse 3 used her cell phone to call the patient's daughter. The patient's daughter did not pick up but then called back shortly thereafter. Nurse 3 explained that the patient was ready for discharge and the daughter said that she would be there in 15 minutes and then the two hung up the phone. (PSLL19)	

Table 8. Collaboration when EM care team members prepares patient for departure from ED

Activities in the discharge process	**Learning**	**Coordination**	**Communication**
EM care team members prepares patient for departure from ED		**Transportation:** Coordinating transportation **out of the ED** (e.g., via wheelchair) • Nurse 3 asked if the patient wanted a wheelchair to be escorted out of the ED. The patient said "yes" and that she didn't want to walk… Nurse 3 returned with a wheelchair and said that she'd leave it in the room so that whenever the patient's daughter arrives, the patient would be ready to go. (PSLL19)	ED care team members discuss with patients activities to help them prepare for departure, including: • Gather patient's personal affects • Helping patient dress • Removing IV, pulse/oxygen monitor, etc. • Bringing in wheelchair, providing directions to help patient exit ED • Helping patient perform oral challenge, road test, and toileting. o Nurse 2 then outlined the next steps for the patient's stay in ED which included: eating, drinking, going to the bathroom, walking. When the patient asked to go to the bathroom, nurse 2 said yes but that he wanted to make sure that she made it to the bathroom in the safest way depending on her ability to walk. (PSLL03)

Table 9. Collaboration when EM nurse talks with patient/care partner about discharge instructions

Activities in the discharge process	**Learning**	**Coordination**	**Communication**

EM nurse talks with patient/care partner about discharge instructions		**Using the D/C instructions document, the nurse talks to pt about:**
		Follow-up with PCP: Coordinating a follow-up appointment with the patient's primary care physician
		• **Recommendation to follow-up with PCP**
		  ○ "Yeah, so we typically say to follow up with your provider in like two days, and it's also on the written discharge instructions that we go over with them at discharge. And oftentimes, we like highlight it that says, follow-up with your primary care doctor in two days." (ED Nurse DB)
		• **Scheduling follow-up appointment with PCP**
		  ○ Nurse 1 told the family to tell the PCP that the patient had just been seen in the ED and that might help expedite the patient's ability to get an appointment. (PSLL03)
			When the EM nurse brings in the printed after visit summary (AVS) and discusses it with the patient and/or care partner
			• RN3 gave the paper instructions to the patient and reviewed the following:
			  You were seen for a fall
			  You got a CT scan that revealed no injury
			  You were given Tylenol
			  You are to see your PCP within 2 days
			  These are your most recent vitals (PSLL19)
			• Nurse 1 came back to the room and talked through the discharge instructions very briefly (less than a minute) and appeared to only walk through the summary of the visit (i.e., this is why you came, this is what you were treated for and by whom, these are your next steps). It seemed as if the nurse 1 was reading the instructions for the first time as he said, "They want you to follow up with your PCP as needed, apparently". (PSLL04)

		• **What to bring to follow-up appointment with PCP** o Nurse 3 encouraged the patient to bring these documents [After Visit Summary] with her when she goes to her PCP so she could show her most recent blood pressure. (PSLL19)	

Types of collaboration

Table 10. Learning categories

Category	Definition (Who & What)	Examples
Helping patient and care partner learn how to use medical tools/devices	Instances where the **ED nurse** or **specialist physician** help the patient or care partner **learn how to use a new medical tool/device** (i.e., sling) **Who:** ED nurse, ortho surgery resident, patient, care partner **What:** how to use new medical tool/device	• ED nurse 1 and ED nurse 2 came into the room to talk about arm mobilization exercises and how to operate the sling (PSLL03) • The orthopedic surgical resident talked to the patient about the next steps with respect to care for his shoulder including the placement of the sling (PSLL04) • "we make sure that they have a sling that, we show the spouse how, or the family member how to place the sling or how to adjust the sling so that they have that education on how to help at home." (ED RN CM)

Table 11. Coordinating categories

Category	Definition (Who & What)	Examples
Home care	Coordinating who is going to help care for the patient once discharged home. **Who:** ED nurse, CP **What:**	• Who is going to stay with the patient ○ Nurse 2 asked the family if the patient could either stay at one of their homes or if one of them would be willing to stay with the patient One family member offered to stay with the patient, and another offered for the patient to come to her house. (PSLL03)

	• who is going to stay with the patient, • who will be able to help move the patient **Care setting:** patient's home	• Who will be able to help move the patient ○ "is there going to be another person there at home to help you get this guy's legs into bed? You know, because it's, again, elderly people are often going home with their elderly spouse and not necessarily a kid or a grandchild to help, so I usually just make sure that they have somebody else on backup." (ED RN CM)

Medications	Coordinating how to access medications prescribed in the ED after patient is discharged home.
	
	Who: ED nurse, ED resident, Pt, CP
	
	What:
	• Wayfinding to ED/hospital pharmacy
	• Where/when to pick up medications and how to take
	
	Care setting: ED/hospital pharmacy, community pharmacy
		• Wayfinding to ED/hospital pharmacy
		  ○ The family was worried because it was around 4 hours before the patient would be going to bed and they still had not yet gotten the prescription filled. nurse 2 said that he would show the family where the pharmacy is located. (PSLL03)
		• Where/when to pick up medications and how to take
		  ○ The ED resident reminded the patient about a medication she would need to take. The patient asked where she could get this medication. The ED resident asked which pharmacy the patient preferred. The patient told her the name of her pharmacy, and the resident said that the patient should go get that medication tomorrow. The ED resident told the patient that she would need to take the medication two times per day and began to list the side effects of the medication (PSLL20)

Transportation	Coordinating transportation out of the ED (e.g., via wheelchair) and transportation home from the ED **Who:** ED nurse, Pt, SW **What:**	• Transportation out of ED ○ "Nurse 3 asked if the patient wanted a wheelchair to be escorted out of the ED. The patient said "yes" and that she didn't want to walk… Nurse 3 returned with a wheelchair and said that she'd leave it in the room so that whenever the patient's

	• Transportation out of the ED (e.g., wheelchair) • transportation home driving oneself, getting a ride from a CP, cab, or ambulance	daughter arrives, the patient would be ready to go.” (PSLL19) • Transportation home o “we just confirm transportation. Like, do you have a ride or are you able to drive yourself, usually, are the two options.” (ED RN JZ) o “Social worker just might communicate, you know, like is this a person from out of state? Are they staying in a hotel? Sometimes hotels offer like cab rides, you know, to and from the hospital. Social work, for example, might help us arrange that” (ED RN JZ) o Nurse 3 asked the patient the best way to get her home. She asked if the patient drove. The patient said “no” and then asked if they had her daughter’s phone number… Nurse 3 didn’t answer the patient’s question and instead verified the patient’s daughter’s phone number. Nurse 3 used her cell phone to call the patient’s daughter. The patient’s daughter did not pick up but then called back shortly thereafter. Nurse 3 explained that the patient was ready for discharge and the daughter said that she would be there in 15 minutes and then the two hung up the phone. (PSLL19) o The patient called her son-in-law to ask for a ride. She said that she was worried about waking the family up. The son-in-law was able to get the daughter and that the daughter could come pick her up. The patient hung up. The patient commented “this is a hell of a time to tell me that I’m going home”.

		10:41 PM: nurse1 came in…The patient told nurse1 that her daughter could come to pick her up but that the daughter did not know how to get to the ED; the daughter only knew how to get to the "clinic side". nurse1 said that she wasn't familiar with Madison, so she didn't know. She said that someone in the ED probably wouldn't be willing to stay on the phone with the patient / daughter to give directions. nurse1 left to find someone who knew Madison. nurse4 entered the room. He recommended that the daughter drive to the hospital and that once she gets close, look for signs that point to the ED. He said that the ED was pretty well marked. He also recommended putting "UW Emergency" into Google Maps. He also gave the patient oral directions to give to her daughter from the "clinic side". nurse4 left. The patient called her daughter back to tell her what nurse4 had said regarding directions to the ED. (PSLL20)

Follow-up with primary care physician	Coordinating a follow-up appointment with the patient's primary care physician
	
	Who: ED RN, pt, ED resident, ED attending
	
	What:
	• Recommendation to follow-up with PCP
	• Scheduling follow-up appointment with PCP
		• Recommendation to follow-up with PCP
		  ○ Nurse 2 said that the patient should follow up with her PCP, reschedule PT (PSLL17)
		  ○ Nurse 3 again encouraged the patient to follow-up with her PCP and the patient said that she'd call tomorrow. The patient asked if the PCP would have a record of her ED visit and Nurse 3 said "yes". (PSLL19)
		• Scheduling follow-up appointment with PCP
		  ○ The family also said that they've tried to get through to the patient's PCP to get an

	- What to bring to follow-up appointment with PCP - Follow-up treatment with PCP (e.g., having stitches removed)	appointment throughout the day since the fall but have not been able to get through. The ED resident told them to try again tomorrow and then left the room. (PSLL03) - What to bring to follow-up appointment with PCP - Nurse 3 encouraged the patient to bring these documents with her when she goes to her PCP so she could show her most recent blood pressure. (PSLL19) - Follow-up treatment with PCP - The ED resident told the patient that she would need to follow up with either her PCP or urgent care to get the staples taken out. (PSLL27)
Follow-up with specialist physician	Coordinating a follow-up appointment with the patient's specialist physician **Who:** ED resident, ED attending, Ortho surgery res, Pt **What:** - Recommendation to follow-up with specialist physician - Scheduling follow-up appointment with specialist physician - Follow-up treatment with specialist physician (e.g., MRI)	- Recommendation to follow-up with specialist physician - He said that the patient needed to follow up with her ophthalmologist within a week. (PSLL27) - Scheduling follow-up appointment with specialist physician - He said that he would attach the number of the ophthalmologist in her discharge paperwork just in case. He said that the ophthalmologist should be able to see everything that was done in the ED today and get her in quicker. (PSLL27) - the orthopedic surgical resident said that someone from the clinic would call in the next few days to set up that appointment (PSLL04) - Follow-up treatment with specialist physician (e.g., MRI) - The attending said that the patient would go home and likely go to an ortho clinic and that that it would be possible that he would need to get an MRI there. (PSLL04)

Follow-up with community-based resources	Coordinating follow-up with community-based resources (e.g., A Place for Mom) **Who:** Social worker, Pt, CP **What:** • Recommendation to follow-up with community-based resources (e.g., A Place for Mom)	• The social worker recommended that the family seek a senior care navigator through A Place for Mom as they would know better than she about senior care options. (PSLL17)

Table 12. Exclude Examples

Reason to exclude	Description	Examples
Disposition decision making (DDM)	Activities performed by ED clinician or patients and care partners to inform the disposition decision making process. For example: • ED clinicians gathering information to make disposition decision. • ED clinician's description of decision making process.	• RESPONDENT: "We didn't find anything wrong. But we didn't have any information as to why she fell down, and she just moved to her memory care facility. And oftentimes in these cases, we will let a patient go home because they have like a supervised, safe place to go. We did kind of a brief medical workup to see if we could find any reason why she fell down, because she couldn't tell us. But in her case, there was some question as to whether she was at her baseline mental status, or whether she was a little bit delirious. INTERVIEWER 1: Okay. RESPONDENT: You know, she clearly didn't, she couldn't remember why she fell down."(EDAtt BP) • [Conversation between ED attending and patient] "Do you feel like you'd be safe to go home today if there are no issues on your CT?" (PSLL19) • "So like a good example is like if someone has a cellulitis or something like that, or, you know, even a UTI, I would think about, it's like, I'm not convinced that there's a lot of people paying attention to them at home. Is this going to be a risk? Let's keep them overnight, give a couple dose of IV antibiotics, and then send them home, you know, in 12 hours when I think that, when I have more confidence that things will be okay…If they're, if they've got family and resources and stuff like that, they can get help, I feel better about it. " (EDAtt MS) • Patient tells ED resident that she doesn't have a ride home. ED resident asks if the patient wants to stay at the hospital, but that she might be transferred. Patient says she will try to find a ride home. ED resident tells patient to use call button when she has an update. (Summary: PSLL20)
Good vs. bad transition	Discussion on what constitutes a good or a bad	Good transition

	transition or suggestions for improvement to the discharge process, which may include: • Patient and care partner receptiveness to discharge instructions or understanding discharge instructions. • Time constraints in the ED.	• "It was a good transition in that the family clearly, and the patient clearly understood if they had problems, to come back to the hospital, etc. You know, you could argue it was a bad transition, because maybe it shouldn't have even happened." (EDAtt MS) • "a key factor is understanding the red flags and what they're supposed to do, is probably one of the biggest factors of it. If they know and understand what they're supposed to do, and how to handle things, when to follow up and all that, that will probably be one of the more robust transitions." (EDAtt MS) Bad transition • "For me, a bad transition is one when something goes wrong, they don't know what to do, and they either do nothing, or they go to the wrong place. And so it's like a bad transition would be, they get prescribed a prescription, and they don't start their prescription, or something like that" (EDAtt MS) • "Patients that aren't receptive to information, patients who like it can be difficult, patients who don't have the cognitive ability if they're confused, or they're under the pain medications on board, or anything like that can make it difficult. Time can be a factor." (EDRN DB)
After time of discharge	Discussion of activities that occur after the time of discharge. For example: • Patient accessing AVS via MyChart at home.	Patient's accessing AVS after discharge. o INTERVIEWER 2: Do you have any idea whether those discharge instructions end up in MyChart? RESPONDENT: Oh, yeah, they're in MyChart. (EDAtt MS)
ED-SNF or ED-hospital transition	Activities performed by ED clinicians that aid in the patient transition between ED-SNF or ED-hospital. For example:	ED-SNF transition o RESPONDENT: Okay. So a patient going back to a facility, if they're medically cleared by a physician to return to the facility, which is determined by our attending MD, we would call the facility back and let them know that they are returning to the facility, maybe what we did here and our findings here, you know, kind of like a nurse to nurse report.

	• ED clinician contacting receiving SNF. • Blue envelope/facility AVS. • ED clinician and/or patient and care partner discussion on being admitted to hospital	○ INTERVIEWER 1: So you call, and you talk to the nurse at the SNF? That's who you . . . RESPONDENT: Well, ideally. Not all facilities have nurses on 24/7, so then we would talk to like an RA or anyone who is the highest there that's going to take our report at that time. We notify someone. (EDRN JZ) ○ RESPONDENT: Yeah, maybe a case, and, you know, if they're going to a nursing home, or some sort of facility, we would talk to staff at the facility for whatever that's worth. (EDAtt MS) ED-hospital transition ○ "The son asked the patient if she would be staying in the hospital. The patient said that she didn't know but that based on what RN1 said, it sounded like she would need to stay." (PSLL20) ○ [Conversation with ED clinician] "He then said she was bleeding and that he wanted to keep an eye on her overnight as she would need to be woken up every few hours to monitor her status. He said that he would need to talk to the neuro doctor who is on overnight. The son asked if the patient had to stay overnight. The neuro resident said that it was a potential. He asked if the patient had anyone to stay with her overnight at home. The patient said that her son lived with her." (PSLL20)
Lacks detail	Lacks detail on what occurs during the actual discharge process.	• "The son told RN2 about what Resident 1 had said. RN2 said that the doctor would come in and talk to them about next steps." (PSLL17) • "The patient asked what they were waiting for. The family predicted that the patient would not be discharged for another 4 hours (I.e. 9:00 PM)." (PSLL03)

Appendix F References

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Appendix G. Demographic data reported by studies of care transitions interventions for older adults in the ED.

		Demographic variables												
Study	**Title**	**Age**	**Sex**	**Race and/or ethnicity**	**Marital status**	**Education**	**Caregiver**	**ADL/IADL**	**Mental status**	**Self-rated health**	**Health literacy**	**No. comorbidities**	**No. daily medications**	**Living arrangement**
Arendts et al. (2012)	The impact of early emergency department allied health intervention on admission rates in older people: A non-randomized clinical trial	X	X									X		X
Arendts et al. (2013)	Outcomes in older patients requiring comprehensive allied health care prior to discharge from the emergency department	X	X											X
Ballabio et al. (2008)	A comprehensive evaluation of elderly people discharged from an emergency department	X	X			X	X						X	
Basic & Conforti (2005)	A prospective, randomized controlled trial of an aged care nurse intervention within the emergency department	X	X		X		X	X	X	X				X
Biese et al. (2014)	A randomized trial exploring the effect of a telephone call follow-up on care plan compliance among older adults discharged home from the emergency department	X	X	X										
Biese et al. (2017)	Telephone follow-up for older adults discharged to home from the emergency department: A pragmatic randomized controlled trial	X	X	X										
Bird et al. (2007)	Integrated care facilitator for older patients with complex health needs reduces hospital demand	X	X											
Bond et al. (2014)	The emergency to home project: impact of an emergency department care coordinator on hospital admission and emergency department utilization among seniors	X	X											X
Caplan et al. (2004)	A randomized, controlled trial of comprehensive geriatric assessment and multidisciplinary intervention after discharge of elderly from the emergency department: The DEED II study	X	X					X	X	X				X
Eklund et al. (2013)	One-year outcome of frailty indicators and activities of daily living following the randomized controlled trial; "Continuum of care for frail older people"		X					X	X	X				X

Foo et al. (2012)	Geriatric assessment and intervention in an emergency department observation unit reduced re-attendance and hospitalization rates	X	X	X				X						
Gagnon et al. (1999)	Randomized controlled trial of nurse case management of frail older people	X	X		X		X	X		X				X
Guttman et al. (2004)	An emergency department-based nurse discharge coordinator for elder patients: Does it make a difference?	X	X											
Hegney et al. (2006)	Nurse discharge planning in the emergency department: A Toowoomba, Australia, study													
Jacobsohn (2021)	Effectiveness of a care transition intervention for older adults discharged home from the emergency department: A randomized controlled trial	X	X	X	X	X		X	X	X	X	X		X
Lee et al. (2007)	A randomized clinical trial to assess the impact on an emergency response system on anxiety and health care use among older emergency patients after a fall	X	X						X					X
McCusker et al. (2001)	Rapid emergency department intervention for older people reduces risk of functional decline: Results of a multicenter randomized trial		X			X	X			X				X
Miller et al. (1996)	Controlled trial of a geriatric case-finding and liason service in an emergency department	X	X	X			X	X	X					X
Mion et al. (2003)	Case finding and referral model for emergency department elders: A randomized clinical trial	X	X	X		X		X	X	X			X	
Mortimer, Emmerton, & Lum (2011)	The impact of an aged care pharmacist in a department of emergency medicine	X	X											
Moss et al. (2002)	A multidisciplinary care coordination team improves emergency department discharge planning practice													
Pedersen et al. (2016)	Early geriatric follow-up after discharge reduces readmissions – A quasi-randomized controlled trial	X	X				X					X		X
Runciman et al. (1996)	Discharge of elderly people from an accident and emergency department: Evaluation of health visitor follow-up	X					X	X						X
Yim et al. (2011)	Emergency department intervention for high-risk elders: identification strategy and randomized controlled trial to reduce hospitalization and institutionalization	X	X					X	X	X		X		

Note: These studies were abstracted from the literature reviews by Hughes et al. (2019) Karam et al. (2015), and Lowthian et al. (2015).

Caregiver: Presence/lack of caregiver or need for caregiving. Measured using the Social Support Instrument (SSI) or by need for caregiving on a three-point scale (i.e., none, weekly/monthly, or daily)
ADL/IADL: Activities of daily living and/or instrumental activities of daily living. Measured using the Barthel index score.
Mental status: Measure of cognitive ability or depression/anxiety. Measured using the Folstein mini mental state examination (MMSE), the geriatric depression score (GDS), generalized anxiety disorder-2 (GAD-2),
Self-rated health: Health as perceived by the older adult. Measured using the SF-36, SF-12, or the identification of seniors at risk (ISAR) tool.
Health literacy: Measured using the perceived health competence scale (PHCS) that measures health-related self-efficacy.
Number of comorbidities: Counted or measured using the Charlson comorbidity index.
Living arrangement: Documentation of one or all the following: older adult lives at home alone, older adult lives at home with others, older adult is institutionalized.

Appendix H. Research Question 2 Codebook
Coding for Work System Barriers and Facilitators to Collaboration

Research Question

What are the work system barriers and facilitators that older adults and ED nurses experience during collaboration at the time of discharge?

How do older adults and ED nurses involved in collaboration during the ED discharge process view barriers and facilitators of the ED discharge process? Are barriers and facilitators reported by older adults and ED nurses similar or different?

Objectives

1. To code the WG3 patient interview data and WG3 ED nurse interview data for work system barriers and facilitators to the collaborative work done during the discharge process.
2. To compare the work system barriers and facilitators for common, unique, and conflicting perspectives of older adults and ED nurses.

Definition of Key Terms

Care transition: "a set of actions designed to ensure the coordination and continuity of health care as patients transfer between different locations (e.g., ED to home)" (Coleman, 2003; Coleman & Boult, 2003)

Discharge: a care transition that is temporally distributed throughout an older adult's ED visit. The discharge process includes: (1) communication and education with older adults, (2) information and support for post-ED care (i.e., discharge planning), and (3) coordination of post-ED care (Boonyasai et al., 2014)

Discharge instructions: a document given to the older adult and/or care partner during the discharge process that includes important clinical information, such as diagnosis, summary of care received in the ED, post-ED care instructions, medication, follow-up and educational materials (Taylor & Cameron, 2000a)

Time of discharge: the period when the ED nurse gives the older adult their discharge instructions and has the discharge conversation. This occurs after the disposition decision is made and before the older adult leaves the ED.

During the time of discharge, the discharge instructions and conversation with the ED nurse may include discussion around the four pillars of care transitions (Coleman et al., 2006; Coleman et al., 2004):

5. medications and medication management,
6. follow-up with primary care physician or specialist,

7. “red-flag” reasons to return to the ED.
8. In addition, specific to the ED time of discharge, is discussion of home care (e.g., wound care, use of medical tool/device)

Collaboration: “an evolving process whereby two or more social entities actively engage in joint activities aimed at achieving at least one shared goal.” (Bedwell et al., 2012)

Methods

We first conducted a deductive content analysis informed by the work system elements:

- Person,
- Task,
- Tools and technology,
- Organization,
- Environment (Carayon et al., 2006; Smith & Carayon-Sainfort, 1989).

The fit, or lack of fit, of work system elements creates barriers or facilitators in the work system (Carayon et al., 2005), which affect the collaboration between older adults and ED nurses during the time of discharge. We identify the proximal, i.e., most immediate (Holden et al., 2013; Hose et al., 2023; Wooldridge et al., 2017), work system element or interaction and whether it is a barrier or facilitator to the balance of the work system.

Next, we conduct an inductive analysis to identify emerging dimensions of work system barriers and facilitators using the constant comparative method (Glaser, 1965).

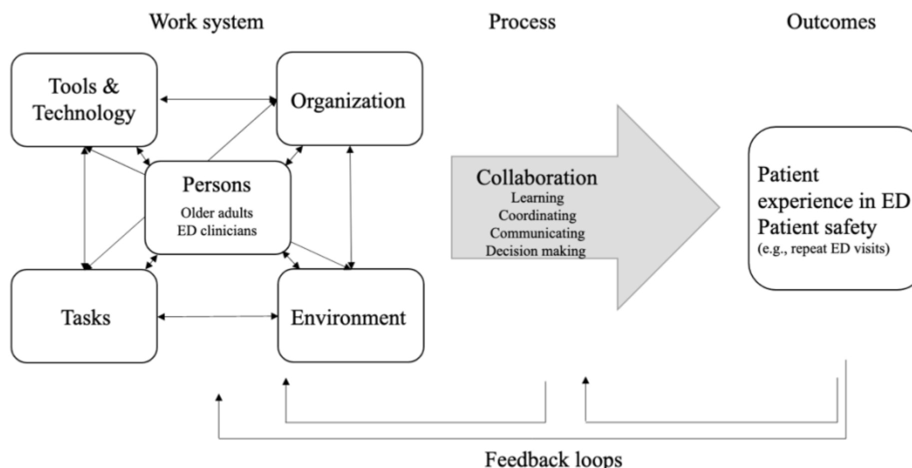
Finally, we produce two lists of work system barriers and facilitators: (1) work system barriers and facilitators experienced by older adults, and (2) work system barriers and facilitators reported by ED nurses. Then, we compared the two lists to identify common, unique, and conflicting barriers and facilitators for the two different roles (Musuuza et al., 2019).

- Common: a facilitator (or barrier) dimension common to multiple roles
- Unique: a facilitator (or barrier) dimension unique to a single role, e.g., ED nurse
- Divergent: dimension in which a facilitator for one role is a barrier for another, e.g., a barrier for the ED nurse is a facilitator for the older adult

Coding definitions

Work system model: according to the work system model, a ***person*** performs a range of ***tasks***, using various ***tools and technology***, under specific ***organizational*** conditions, within a certain ***physical environment*** (Carayon, 2009; Carayon et al., 2006; Smith & Carayon-Sainfort, 1989). Figure 1 depicts how the five work system elements interact during older adult and ED nurse collaboration.

Figure 1. SEIPS model applied to patient and nurse collaboration in the ED



- **Person:** Individual characteristics of the older adult or ED nurse, including experience, skills, knowledge, physical, and/or psychological characteristics, that help or hinder collaboration during the discharge process.
  - Person – ED clinician:
    - "So she was very nice girl, just super. She couldn't have been any nicer and accommodating" (ED Pt 2)
    - "anything I've had to do with emergency… has been nothing but professional and kind." (ED Pt 2)
  - Person – patient:
    - "I might have forgotten some of it too, so." (ED Pt 2)
    - "But you know, just, I was thinking way ahead. So your mind is not, at least mine is, was not what it normally would be. You know, you're kind of jumping all over the place." (ED Pt 1)
- **Organization:** the larger organizational context related to older adult and ED nurse collaboration during the discharging process, including, the ED culture, policies and procedures, work schedules, ED nurse training.
  - ED nurse work organization
    - "you could have three different physicians to follow up with as needed, so it's a little bit confusing for a nurse who's supporting a different nurse to discharge to figure out what they should be telling the patient to do." (ED RN 2)
    - "That's probably nice for, you know, some of the nurses that are, we basically, we only do this on day shift. So people that have come from

other shifts that are just starting to do those, that's probably nice since they haven't done them before." [Talking about the EHR tips for follow-up calls](ED RN 2)

- "Prior to going in the room. As soon as I take it off the printer, I highlight what I think is the most important that I want, I don't want them to forget. So I'll highlight, well, I'll highlight their name just to make sure I'm like I've got the right patient, the ER phone number in case they have questions because that's on the top right, and then I'll highlight like on the instructions. Like that part, the one part that says what to do at home, I'll highlight that.

  If prescriptions are going to be picked up at a pharmacy, I'll highlight the pharmacy. And then if they want them to follow up with their primary doc in like two days, I'll highlight the primary doc and the phone number. So those are kind of my main areas that I highlight. " (ED RN 2)

- Time constraints in ED
  - "But I feel like it's, when we're discharging someone, usually it's like hurry up, get them out, there's a new patient to come in. So I feel like that process is always rushed" (ED RN 2)

- **Task-Organization:** interactions between the ED nurse and the older adult and care partner at the time of discharge.
  - Older adult, care partner, and ED nurse interacting
    - "Well, she got a walker for me, and she showed me how to use it, you know. Took about 15 minutes, I guess. But it was very helpful to me because I have to have the walker now at home." (ED Pt 2)
    - "when you're explaining your discharge, patients get distracted by that [vital signs] and they start looking at that instead of listening to what you're saying about what's actually important on there, so that was really helpful" (ED RN 3)
    - "So that's why I like that you guys did the bullet points and things like that. Because even if they're walking out the door and I'm talking at the same time, they still have those like really quick looks." (ED RN 3)
    - And if you're just emotionally traumatized, that has to be taken into account in the conversation between the staff and the patients. (ED Pt 1)
  - ED nurse pointing out, telling, older adult and/or care partner at time of discharge
    - "I think the fact that it includes the specific testing and treatments that were done is *helpful to point out to patients* when they're being discharged." (ED RN 2)
    - "I was *told* both verbally and in written form." (ED Pt 3)

        - "easier for me to see when I'm explaining it to them, so that I can kind of point out certain things." (ED RN 3)

- **Tool and Technology:** characteristics (e.g., usability, medium) of the tools and technologies (e.g., EHR, After Visit Summary (AVS) or discharge instructions) used during the ED patient, care partner, and ED nurse collaboration during the discharge process.
    - Information elements of the AVS
        - "having the *prescription information* in there is definitely also a *big positive*, I'd say, in the recommendations." (ED RN 2)
        - "I feel like getting a *whole packet of this information handed to you is a lot* for them to process of just them going out," (ED RN 2)
        - "I've gotten *so much stuff*." (ED Pt 2) [Talking about documents from the ED]
        - "So *it's good that they have written the same instructions* as she told me."
        - "And they gave me [inaudible, 03:17:3], you know, pamphlets and things, which was very important to be able to reread" (ED Pt 6)
        - "I usually attach the, the like handout that explains more details about how to care for whatever it is at home, and I staple them all together, so it's all in one place for them. " (ED RN 3)
    - Format of the AVS
        - "So I really like, like on there, you have like *the bolded text*." (ED RN 4)
- **Tools and Technology-Task-Organization:** interactions between the older adult and during the time of discharge that involve the use of the AVS.
    - "So I think it's [AVS]just made it easier for me to teach, and I think it's been more effective teaching." (ED RN 6)
    - "I'll go in there, then talk to them about it. I'll kind of read it through, point out where I'm getting the information, highlight important things." (ED RN 5)
    - "You know, I saw exactly where she had pointed it out [on the AVS]. I knew who I was going to be following up with, you know, with ortho." (Pt 13)
- **Environment:** characteristics (e.g., layout, noise, lighting, temperature) of the physical environment/specific location (e.g., patient room) where the older adult, care partner, and ED nurse collaborate during the discharge process.
    - "I'm going to start talking to as we're walking out because I have another patient coming into your room as we speak. So it's hard. They're looking around. They're trying to figure out. It's a very different environment." (ED RN 7)

Barrier: a characteristic of a work system element or interaction that interferes with a person's ability to accomplish a goal or activity efficiently, appropriately, and accurately (Carayon et al., 2005)
Facilitator: a characteristic of a work system element or interaction that makes it easy to accomplish a goal or activity efficiently, appropriately, and accurately (Carayon et al., 2005)
Collaboration: "an evolving process whereby two or more social entities actively engage in joint activities aimed at achieving at least one shared goal." (Bedwell et al., 2012).

- **Inclusion criteria:**
  - Instances where the ED nurse or older adult discuss work system barriers or facilitators to interacting at the time of discharge.
    - "So then they kind of are like, I know that they're thinking that, well, I have a doc, I can get a hold of them. " (ED RN 1) [conversation between ED nurse and older adult at time of discharge about contacting PCP once home]
    - "So I think it helps me to organize it if I highlight it so I'm hitting on those main things." (ED RN 1)
  - Instances where the ED nurse or older adult mention general work system barriers and facilitators to the time of discharge.
    - "I felt kind of tired of it, you know, just done in. It was a shock to my body." (ED Pt1)
    - Older adult preference for information
      - E.g., INTERVIEWER: And so do you think that information was, do you think there was too much information then on the AVS, or was there not enough information ultimately? RESPONDENT: Well, for me, it was very good. (ED Pt1)
- **Exclusion criteria:**
  - Instances where the ED nurse talks about work system barriers and facilitators to the discharge process that relate only to clinical work, e.g., preparing the discharge instructions or patient, e.g., how the AVS helps the patient care for themselves at home.
    - "Prior to going in the room. As soon as I take it off the printer, I highlight what I think is the most important that I want, I don't want them to forget. So I'll highlight, well, I'll highlight their name just to make sure I'm like I've got the right patient, the ER phone number in case they have questions because that's on the top right, and then I'll highlight like on the instructions. Like that part, the one part that says what to do at home, I'll highlight that.
      If prescriptions are going to be picked up at a pharmacy, I'll highlight the pharmacy. And then if they want them to follow up with their primary doc in like two days, I'll highlight the primary doc and the phone number. So those are kind of my main areas that I highlight." (ED RN1)

        - [Talking about a patient reading the AVS at home] "But so that if they're looking at it again, their eyes kind of go there. Like this is what I'm supposed to be doing, which I think, part of it now is bold." (ED RN1)
    - Instances where the patient talks about work system barriers and facilitators to caring for themselves ***after*** the time of discharge, e.g., in their car, on their way home.
        - "But the discharge summary told me exactly what to do. If my headache worsened, then I was, you know, if it didn't get better as the week went on, I needed to call back. It was very specific as to what to do. Follow up, you know, with your physician, and I actually did call once, because my headache was not going away. So I was glad that that was mentioned very specifically in there. And the way it was printed out, just, it was very direct. Do this, do this, and do this. If this occurs, then do this, you know. So there was very clear direction." (ED Pt1)
    - Instances where the ED nurse or patient talk about things that happened during the ED visit ***before*** the time of discharge
        - "So going back to the emergency room time, there was a lot of talk about, you know, if I could, how I was going to function in the house as a, you know, a single older man without any caretakers present. So we had several conversations about that, and the emergency department agreed to loan me a wheelchair to help me to be able to get, you know, move around a little bit more easily. " (ED Pt 8)
        - "INTERVIEWER: Yeah. Do you feel like your concerns about your pain were addressed while you were in the ED? RESPONDENT: Yeah. And we talked openly about it because I'm in recovery, and was, you know, I, you know, was leery of actual, you know, what opioid-based pain meds would be like. But, you know, we decided that that would be the best situation, and I'm just sticking to the prescription" (ED Pt 8)

ED RN: Patient: work system barriers or facilitators that the ED nurse identifies for older adults and their care partners in the ED.

- "I think patients like that too." [Talking about last dose of medications given in ED on AVS] (ED RN 1)

Patient: ED RN: work system barriers or facilitators that older adults identify for ED nurses in the ED.

Coding procedure:

- PC and KW individually code ED RN 1 transcript in MS Word using comment boxed structured with "B" or "F" for barrier or facilitator, proximal work system element, and

brief description of coded text. PC sends coded transcript to KW. KW integrate PC and KW coding into one MS Word document. PC and KW meet to discuss.

  - Repeat process for ED Pt 1, ED RN 2, ED Pt 2, ED RN 3, ED Pt 3, ED RN 4, and ED Pt 4

- KW input coding for ED RN 1-4 and ED Pt 1-4 into Dedoose.
  - KW marks excerpts to discuss with code "Questions to discuss"
  - KW and PC meet and discuss "Questions to discuss" and decisions made are document in codebook.
- PC and KW individually add emerging dimensions of work system barriers and facilitators to Table 3. When PC and KW meet to discuss coding, we also review Table 3.
- PC codes ED Pt10-15 and ED RN 10. KW reviews and inputs coding into Dedoose.
- KW exports excerpts to Excel and creates tabs for each work system element or interaction.
- KW and PC review and summarize the emerging work system dimensions in Table 3 and create an initial list of emerging dimensions for each work system element or interaction.
- KW codes data for emerging dimensions; defining the dimensions and providing examples in Table 2 . PC and KW iteratively review and discuss how emerging dimensions present in the data, adding, combining, and subtracting dimensions based on the results. Further, moving excerpts between work system elements or interactions and creating new work system elements or interactions, if necessary.

Coding decisions:

- KW Advising Meeting (March 9th): PC and KW decided to add a code for collaboration to coding structure.
- KW review of ED Pt 1, ED RN 1, ED Pt2 and ED RN 2 (March 15th): Added vague statements and older adult's previous medical experiences to exclusion criteria based off PC feedback in Dedoose.
- KW Advising Meeting (March 16th): PC and KW decided to refine the definition of task to include one-way communication/activities and the definition of organization to include closed-loop, reciprocal communication. We also decided to refine the definition of tools and technology to include information.
- KW Advising Meeting (March 21st): PC and KW decided to code barriers and facilitators related to the communication between the ED nurse and the older adult and care partner as a new code Task/organization. Some potential emerging dimensions include:
  - Teach back
  - Open communication
  - Opportunity to as question

- Email correspondence from PC (April 28th): PC suggested moving barriers and facilitators for dimension "Older adult and ED nurse communication with the AVS" under work system interaction Task-Organization to a new work system interaction Tools and Technology-Task-Organization. See full email at end of Appendix H.

Out of scope:

- Vague statements about ED experience that don't relate to a specific work system barrier or facilitator and/or discharge process.
    - "You know, everything seemed positive to me" (ED Pt 2)
    - "I got to tell you again, UW is pretty fantastic." (ED Pt 2)
    - "I think it's, I think it's designed great." (ED RN 4) [in reference to the AVS]
    - "Everybody introduced themselves, but of course, you can't remember their names." (ED Pt 3)
    - "I had one nurse that was with me the whole time" (ED Pt 3)
    - "we had to wait for our doctor. The doctors had to look at, oh, who was it? It was the neurologist had to look at my MRI, I guess, of my brain or whatever, my head wound, and it just took a while." (ED Pt 3)
    - "Well, I think it was very helpful." (ED Pt 4) [talking about what would have been helpful during discharge conversation]
    - "you get frustrated, you know. Things always take a little longer than what you'd like when you're there," (ED Pt 4)
- Statements about older adult's previous medical experiences that don't relate to the discharge process
    - "I've been in and out of the, you know, I've had so much to do in my life with surgery and stuff like that." (ED Pt 2)
- Not about older adult patients (i.e., specific to pediatric patients)
    - "The only time that I really have is like in pediatrics, they have like Tylenol and ibuprofen charts for patients based off of their weight, and I find that I add that quite frequently just because it's something really good for the parents to have." (ED RN 4)
- Description of the ED process that don't include specific barriers or facilitators.
    - "we call and we basically say, is, do you have any questions about your discharge instructions? Were you able to pick up your prescription from the pharmacy? " (ED RN 4)

Table 1. Emerging dimensions of work system barriers and facilitators.

No.	Interviewee ID	Interviewee role	Coder initials	Person	Tasks	Tools/technologies	Environment	Organization	Task/Organization
1	ED RN 1	ED RN	KW					Two types of time pressure: 1. ED time pressure (e.g., get pt out to accommodate new pts) 2. Pt time pressure (e.g., patient ready to leave)	
2	ED Pt01	Pt	PC						Two dimensions: 1. Intimate conversation, very good rapport (social) 2. Repeat instructions, going over what to do at home (technical)
3	ED RN 2	ED RN	PC/KW			Information overload for pt			ED nurse points out specific information to pt
4	ED Pt2		PC/KW		Pt getting new medical device and learning				

No.	Interviewee ID	Interviewee role	Coder initials	Person	Tasks	Tools/technologies	Environment	Organization	Task/Organization
					how to use it				
5	ED RN 3	ED RN	PC	Pt characteristics that hinder collaboration (e.g. in pain, not feeling well)				Presence of CP during D/C helps info sharing/comm with nurse	Workflow of nurse: teach back performed before D/C, along the way
6	ED Pt3	Pt							
7	ED RN 4								
8	ED Pt 4	Pt	KW					Involvement of care partner in d/c processes a facilitator	
9	ED RN 5	ED RN	KW	ED nurse knows pt, took care of pt during ED visit					Teach back usually about medications, or med devices (e.g., catheter, sling, crutches) ED nurse does teach back with pt and cp so they can learn from each other's understanding
10	ED Pt 5	Pt	KW						ED nurse conveys updated info from ortho before pt d/c from ED

No.	Interviewee ID	Interviewee role	Coder initials	Person	Tasks	Tools/technologies	Environment	Organization	Task/Organization
11	ED Pt 6								F: nurse gives AVS to pt and cp
12	ED RN7	ED RN	PC	Person-pt: Tech-savvy			Hallway? (where D/C instructions are provided to pt who is on his/her way out)		About T-O: ambiguous message given to pt about calling ED
13	ED RN 7	ED RN	KW			F: Don't have to page through AVS – important into on front page, extra info (e.g., seatbelts, smoking) at back B: ED phone # difficult to read on AVS (prints poorly) F: Larger font better for pt to read quickly + pts with poor eyesight	D/c conversation in hallway/waling out of ED	D/c quick – a lot of info pt cannot take in Limited number of cp in ED	
14	ED Pt7	Pt	PC	Pt not in serious condition: therefore lack of communication					
15	ED Pt 7	Pt	KW					ED nurse shift change	B: didn't discuss home care, sling or pain management (e.g., ice)

No.	Interviewee ID	Interviewee role	Coder initials	Person	Tasks	Tools/technologies	Environment	Organization	Task/Organization
									B: ED nurse put AVS on pt night stand; didn't review with pt
16	ED RN 8								
17	ED Pt 9								
18	ED RN 9	RN	KW					Language barrier	
19	ED Pt 10					Detailed description of B/F of info in AVS			
20	ED RN 10								
21	ED Pt 11								
22	ED Pt 12								
23	ED Pt 13								
24	ED Pt 14							A lot of ED clinicians/staff in ED; not always clear their role (don't always introduce themselves)	
25	ED Pt 15	Pt	PC						B: Pt would have liked to have more conversation about what to expect with regard to

No.	Interviewee ID	Interviewee role	Coder initials	Person	Tasks	Tools/technologies	Environment	Organization	Task/Organization
									recovery from back injury

Table 2. Emerging work system dimensions

Work system elements and interactions	Dimension	Description	Examples
Person	Patient characteristics	Work system barriers and facilitators related to the older adult's emotional state (e.g., exhausted, nervous, distracted, ready to leave ED), physical state (e.g., limited cognition, hearing limitations, medical tools/devices), or knowledge (e.g., health literacy, career in healthcare, familiarity with UWH).	• "Yes, very much so. And also their state of, their **emotional state**. There's how much **pain** [physical state] they're in. All those enter in to conversations because, if you're in a lot of pain, you don't feel like listening or talking a lot of the time." (Pt 1) Emotional state (Barrier) • "distracted or, as I tend to be when I'm in a somewhat stressful situation." (Pt 3) • "But you know, just, I was thinking way ahead. So your mind is not, at least mine is, was not what it normally would be. You know, you're kind of jumping all over the place." (Pt 1) • "But I think sometimes it's just hard because, you know, we're discharging them from the ER, so you've probably got hard day, most of them" (ED RN 6) Physical state (Barrier) • "I was sitting laying there in a neck collar for several hours very uncomfortable." (Pt 7) • "they're not hearing it, or they've been medicated" (ED RN 7) • "the patient either, either is in pain or like not feeling well, so they're not going to listen very well." (ED RN 3) • "They don't always hear. I know we're not talking about my situation, but they don't always hear it the first time." (Pt 1) Knowledge • F:"I mean, whatever level of understanding, I'm pretty literate." (Pt 5)

			• F: "I was a nurse at Children's Hospital there for 30 years, so it's not like I'm a naïve person in the emergency room. I mean, I know what they're doing and why they're doing it, so I didn't have to play catch up much with what they were doing." (Pt 13) • B: " I do find like some of the language barriers, if it's not, it's maybe always in English, so trying to get the doctors to print it in Spanish or whatever language, it is, can be sometimes cumbersome, like a language barrier." (ED RN 9) • B: "it didn't occur to me to ask. And so it wasn't because I felt like we were hurried. No, it was not because I felt like we were hurried. It didn't occur to me to ask." (Pt 15)
	Nurse characteristics	Work system facilitators that are related to nurse characteristics, such as the nurse being knowledgeable of the patient, the nurse being helpful, and the nurse being a good conversationalist.	Nurse knowledge • F: "So if it's a patient that I've had for several hours, and I'm familiar with their, kind of their treatment, their plan of care, their history, kind of where they're at like with the understanding of medical information, 100%." (ED RN 4) • F: "They're likely my patient, so I kind of knew what was probably going to be in the paperwork. " (ED RN 5) • F: "The nurse was extremely knowledgeable of, you know, the events of why I was there and what I was attempting to do." (ED Pt 5) Nurse helpful • F: "So she was very nice girl, just super. She couldn't have been any nicer and accommodating." (Pt 2) • F: "I had a really good nurse. She had won a DAISY Award already. I would've nominated her again." (Pt 10) Nurse good conversationalist • F: "very good conversationalists and helpful." (Pt 10) • F: "she was very descriptive, very helpful." (Pt 5)

			• F: “So Joe is very, he, well, first of all, he was very helpful. He did things I asked him. He shared with me things about me, you know, about what’s kind of happening. He did a great job.” (Pt 11)
T&T	General perceptions of the AVS	Work system barriers and facilitators that are related to the general perceptions that older adults and ED nurses have about the AVS.	• F: “it’s much more clear and concise.” (ED RN 6) • B: “What did you think of the discharge summaries that you received? RESPONDENT: I thought they were more than adequate. Yeah.” (Pt 12) B: “I guess from what you can remember from those discharge papers, was there anything that you felt was really helpful and then anything that you felt was not helpful? RESPONDENT: No, it was pretty generic” (Pt 11)
	Format of AVS	Work system barriers and facilitators that are related to the ***layout*** and ***organization*** of the AVS. Examples include: • Font size, bolding, bullet points, graphics • Flow of information on AVS (e.g., organization of information, important information on first page)	Layout: • F: “I like that the printing is bigger” (ED RN 7) • F: “I also like that there’s bullet points for what to do at home.” (ED RN 3) • F: “The font is that much bigger and like having it bolded out like, okay, this is, I think that’s a lot nicer, so it’s easier to follow, I think.” (ED RN 8) • B: “My suggestion would be to make the phone number for the emergency room a little bit bigger because when we say, hey, if you have any questions, you can call us back you cannot read the numbers at all. They’re so small, and they, for whatever reason with the printers, you can barely read them. So not that I want people to call us back, but I feel like that information should be a little bit more accessible.” (ED RN 7) • F: “And what was especially helpful was the illustration of a head with a brain inside the skull. That, you know, sort of caught my attention right away. That illustration was very good.” (Pt 10)

			Organization: • F: "So I feel like this seems to be like all the most important information is right up front." (ED RN 10) • F: "that adds a little more like everything is on one or two pages." (ED RN 9) • F: "The first two pages are sensibly organized, and I think that almost anyone who has at least an average degree of literacy can make sense of this. You start out with a section on instructions, and then there's a section on, you know, we've called in a prescription to the drug store, and here's where the drug store is. That makes perfect sense." (Pt 15) • F: "I like that the, we got rid of the two columns. I think it makes it easier to read stuff too." (ED RN 8) • B: "I almost feel like the new medications that they're starting, I wish that there was a part on the first page that says how to take them." (ED RN 3)
	Content of information in AVS	Work system barriers and facilitators that are related to the content of the information on the AVS. Examples include: • What information is included in the AVS (e.g., discharge instructions, follow-up, medications and dosing information, pharmacy, tests completed in ED, vital signs, names of ED clinicians, ED contact information) • What information is excluded from the AVS (e.g., wound care) • How the information is presented (e.g., no medical jargon, information tailored to patient)	Information included: • F: "I love how, you know, how put the last dose of medication, all, you know, the times that they were given and all the lab tests that were, all the lab tests, x-rays, just tests that were done. (ED RN 10) Information excluded: • F: "I found helpful is that you guys took out the vital signs that are on there" (ED RN 3) Information presentation: • F: "I think it's kind of just right. It kind of explains like you're having atypical chest pain and what that means. It's kind of like a layman's term. I think it's, the jargon has gotten a lot better, a little, yeah, I think it's just spot on." (ED RN 9)
	Amount of information on AVS	Work system barriers and facilitators that are related to the amount of information included in the AVS.	• B: "I mean, some of these are like five pages long or more, and some of the information is just so not, I don't think it's really necessary." (ED RN 10)

			• B: "But the end of like the seatbelts and the suicide and that, that little page and a half is just, it's too much. Now I am, literally, when I go through that with my patients, I say, this says don't smoke cigarettes and wear your seatbelt, and I skip it, you know." (ED RN 6)
T&T-Task-Organization	Older adult and ED nurse communication with the AVS	Work system barriers and facilitators related to the older adult and ED nurses discussing the AVS at the time of discharge. For example, • Challenges in communicating information on AVS (i.e., when discharging another nurses patient, explaining extra information on AVS) How to AVS facilitates the communication between the older adult and ED nurse (e.g., pointing out information, AVS something patient can refer to during conversation)	• B: "you could have three different physicians to follow up with as needed, so it's a little bit confusing for a nurse who's supporting a different nurse to discharge to figure out what they should be telling the patient to do." (ED RN 2) • F: "she gave me some notes or paper and kindly iterated in case you didn't catch everything," (Pt 3) • F: "I still point that out because I think it's good information for them to have. I do think it's beneficial." (ED RN 2)
Task-Organization	Quality of communication	Work system barriers and facilitators related to the quality of the communication between the older adult and ED nurse during the time of discharge. For example, • Clear, direct, descriptive, intimate conversations • ED clinicians tailoring conversation/terminology to older adult's understanding • Being told the same information multiple times and through multiple modes (e.g., verbally, written) • Length of the conversation	• F: "What was helpful was that it, for me, it was an intimate conversation, you know, just reviewing and then her having, and I repeated." (Pt 1) • B: "It was very brief." (Pt 7) • F: "geared towards my level and ability to understand the directives and the directions." (Pt 5) • B: "we're like blah, blah, blah, blah, blah and you read all this stuff out." (ED RN 7)
	Content of communication	Work system barriers and facilitators that are related to the what the older adult and ED nurse discuss or do not discuss during the time of discharge communication. This may include: • What happened in the ED (e.g., diagnosis, tests/scans done, results) • Medications • Red flags (i.e., when to return to the ED)	• F: "It's more if they're getting prescribed like an opioid or something that's going to make them have certain side effects, I make sure to pinpoint the specific side effects we're looking for." (ED RN 3) • F: "They actually went through the imaging that was done" (Pt 4) • B: "And it's helpful when somebody reminds you ice and heat are your friend and, you know, RICE,

		• How to care for self at home • What symptoms to expect at home • Follow-up care (e.g., PCP, specialist)	the old saying, rest, ice, and I can't remember what the C-E stands for. But so that's, you know, I think it just would show if somebody would just stop for a few minutes and say, hey, this is where you're at, this is what's going on. And you will experience pain for several days, and ice it, put heat on it, that type of thing." (Pt 7) • "I'm already telling them so much information, medication, you know, administration, when to go, you know, where to go, how much to take." (ED RN 6)
	Questions and answers	Work system facilitators related to the older adult and ED nurse asking and answering questions during the discharge communication. For example, • How ED nurse asks questions • Opportunity for patients to ask questions	• F: "I was asking them my questions, and they were very helpful in answering those questions." (Pt 5) • F: "And that's one of the things that I ask everybody when I finish giving the instructions. I'm like, what questions do you have? And I think that's a big question that people have to say, not, do you have any questions but what questions do you have . .. PROFESSOR CARAYON: I see. ED RN 7: . . . of me right now? And because it tends to leave people to say, oh, I don't get this. Or what about that?" (ED Rn 7)
	Teach back	Work system barriers and facilitators to using the teach back method during the older adult and ED nurse communication at the time of discharge. For example, • What information ED nurses use teach back for (e.g., medications, medical devices (i.e., catheter, sling, splint, walker), wound dressing, red flags) How to ED nurse does teach back (e.g., tailoring to older adult's level of understanding)	• F: "I look mostly at what the patient needs for their understanding and then try and tailor information that they're being handed out to make sure that they understand it all. But, definitely, I mean, you know, a laceration versus a broken bone, it's going to, their teach back is going to be very different. " (ED RN 2) • F: "Like, yeah, I would go over like you're going home with this antibiotic. You're going to take it three times a day. And then, you know, I'll just say like common side effects and sort of like, you know, tell me what, what I just said, or, you know, tell me what questions you have." (ED RN 4) • F: "Well, she got a walker for me, and she showed me how to use it, you know. Took about 15

			minutes, I guess. But it was very helpful to me because I have to have the walker now at home." (Pt 2)
Environment	Discharge process in hallway	Work system barriers that are related to the ED environment that older adult and ED nurse collaboration occurs in during the discharge process.	• B: "I'm going to start talking to as we're walking out because I have another patient coming into your room as we speak. So it's hard. They're looking around. They're trying to figure out. It's a very different environment." (ED RN 7)
Organization	Time availability in the ED	Work system barriers that are related to the time pressure that is experienced in the ED, including: • How time pressure hinders teach back • Pressure to change over patient room • Time pressure during the time of discharge Or Work system facilitators that show sufficient amount of time (i.e., lack of time pressure) during the time of discharge.	Teach Back Time pressure to change over patient room • B: "But I feel like it's, when we're discharging someone, usually it's like hurry up, get them out, there's a new patient to come in. So I feel like that process is always rushed" (ED RN 1) Time pressure during time of discharge conversation between patient, care partner, and ED nurse • B: "I mean, we didn't really have a lot of time to chat. She was pretty busy, and so, you know, it's just kind of business, and, you know, kept things moving." (Pt 13) • B: "We really didn't have a conversation like that. Honest, it was the strangest, they were so busy that day." (Pt 7) • B: "I don't think the discharge was more than three minutes." (Pt 7) • B: ""On mine. It's, you know, busy, and it's, you're frequently pulled away to, because, you know, your other room is getting an ambulance or your code lights are going off, so time, really" (ED RN 4) Time pressure not inhibiting collaboration during the ED discharge process. • "I had more than sufficient time with the nurse" (Pt 5) • "No, I didn't feel rushed. I think they were, I mean, it was a busy, busy day, all right. I mean, I got moved from one room to another because of how

			busy, so I understood how busy it was. But I did not feel rushed." (Pt 14)
	Time pressure experienced by older adults	Work system barriers that are related to time pressure that the older adult patient imposes on the discharge process	• B: "Part of it was I wanted to get out of there" (Pt 12) • B: "Other days, the patients have been waiting for ten hours and they're like I'm done. I can't, I need to get out." (ED RN 1)
	Care partner in the ED	Work system barriers or facilitators that are related to the presence or lack of presence of the care partner in the ED at the time of discharge.	• F: "Before I discharge them, I guess I consider having family or, having family or caregiver there for instructions." (ED RN 10) • F:" I mean, I'll talk to both of them, like kind of at the same time, you know, make sure to include both of them" (ED RN 5) • B: "especially now with how many family members, or limited family members, it's harder depending on who it is. Is it your 80-some-year-old spouse who also doesn't get this? You know, and they're like, okay, sounds good. And I think we're okay, and they're not." (ED RN 7) • F: "You know, she just was, my wife was kind of taking charge of what was going to happen when we left and when we got home." (Pt 4)
	Lack of care continuity	Work system barriers that are related to lack of continuity in ED nurse care during the discharge process, including: • Shift change/handoffs • Number of nurses caring for patient	Shift change/handoffs • B: "RESPONDENT: The nurses had changed shift . . . INTERVIEWER: Okay. RESPONDENT: . . . by the time they were releasing me. And so the new ones were really not up on what, you know, was going on." (Pt 7)_ Number of nurses • "And it got to the point where there was way too many people around and where are you from and what are you doing type thing." (Pt 6)

Email correspondence from Professor Carayon on April 28th, 2023

RE: RQ2 Database and Codebook

PASCALE CARAYON <pcarayon@wisc.edu>
Fri 4/28/2023 7:52 AM
To: Kathryn Wust <wust@wisc.edu>

Hi Kathryn,

I have reviewed your Excel file. You have really interesting data! 😊

There were a few excerpts marked "1" for PC/KW to discuss. I reviewed them all. I also reviewed all of the data for each emerging dimension (for consistency, …).

Check the comments that I highlighted in 'blue'; this is where I put some feedback on your coding and the emerging dimensions. You can let me know if any of these need to be discussed next Tuesday.

About the dimensions, you need neutral language for many of them (when there are both B and F):

- E.g., presence of CP: should be "presence or absence of CP". The only B in this dimension is related to the absence of CP because of the policy during COVID.
- Time pressure in the ED → time pressure in the ED or sufficient time for pt-nurse collaboration (or something like that).
- …

'time pressure: patient' is really about the pt wanting to leave the ED and in a hurry to leave. This is only a B; so the 'language' for this does not need to be neutral. Revise the name to be closer to the content of the B; e.g. "pt in hurry to leave ED" (or something like that).

A lof of what is coded under T/T is an interaction between T/T and task. What about renaming this "element" as "T/T – Task" (in a way similar to Task-O)?

About the emerging dimension of 'Communication with AVS'… I am wondering whether this should be its own 'element', i.e. "T/T – Task – Organization"; an interaction between the technology (AVS) and the T-O. What do you think?

You may end up with a column of "WS elements" that is more than elements; you may want to be rename the column: "WS elements and interactions". Let's discuss on Tuesday.

For "content of communication", I was looking for specific content mentioned, e.g. meds, pain management, red flags, PCP, etc… When there was no specific content, I suggested that the excerpts be moved, e.g. to "communication with AVS" or "quality of communication". By focusing "content of communication" on specific content, you will be able to do a more targeted comparison for RQ2B: i.e. looking for content that nurses describe versus content that patients describe.

I also reviewed your coding book and made some comments/suggestions, in particular on how your RQ are worded.

I hope that the writing is going well. 😊

Have a good week-end and talk to you on Tuesday.

PC

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Appendix I. Frequency of excerpts of work system barriers and facilitators experienced by older adults (N =15) and ED nurses (N=10).

Work system elements and interactions	Dimensions	Barriers		Facilitators	
		Older adult*	ED nurse~	Older adult*	ED nurse~
Person	Older adult characteristics	15	11	5	0
	ED nurse characteristics	0	0	12	2
Technology and tools	General perceptions of AVS	1	0	2	4
	Format of AVS	0	10	8	24
	Content of information on AVS	15	2	23	16
	Amount of information on AVS	6	3	4	1
Technology and tools – Task - Organization	Older adult and ED nurse communication with the AVS	1	3	5	34
Task - Organization	Quality of communication	4	2	20	2
	Content of communication	15	0	26	11
	Questions and answers	0	0	3	6
	Teach back	0	1	3	15
Environment	Physical environment	0	1	0	0
Organization	Time availability in the ED	8	13	7	0
	Time pressure experienced by older adults	1	6	0	0
	Care partner in ED	0	1	5	4
	Lack of care continuity	6	0	0	0

Note: the counts are the number of excerpts where a barrier or facilitator was mentioned, not the number of interviewees who mentioned the barrier or facilitator.

* Number of excerpts from 15 older adult interviews

~ Number of excerpts from 10 ED nurse interviews

Appendix J. Frequency of excerpts of work system barriers and facilitators identified from the other perspective.

Work system elements and interactions	Dimensions	Barriers		Facilitators	
		Older adult for ED nurse*	ED nurse for older adult~	Older adult for ED nurse*	ED nurse for older adult~
Person	Older adult characteristics	0	**2**	0	0
	ED nurse characteristics	0	0	0	0
Technology and tools	General perceptions of AVS	0	0	0	**2**
	Format of AVS	0	**1**	0	**8**
	Content of information on AVS	0	0	0	**4**
	Amount of information on AVS	0	**3**	0	0
Technology and tools – Task - Organization	Older adult and ED nurse communication with the AVS	0	0	0	0
Task - Organization	Quality of communication	0	0	**1**	0
	Content of communication	0	0	0	0
	Questions and answers	0	0	0	0
	Teach back	0	0	0	0
Environment	Physical environment	0	0	0	0
Organization	Time availability in the ED	**3**	0	0	0
	Time pressure experienced by older adults	0	0	0	0
	Care partner in ED	0	0	0	0
	Lack of care continuity	0	0	0	0

Note: the counts are the number of excerpts where a barrier or facilitator was mentioned, not the number of interviewees who mentioned the barrier or facilitator.

* Number of excerpts from 15 older adult interviews

~ Number of excerpts from 10 ED nurse interviews

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