



**A multi-level stakeholder-centered approach to investigate unnecessary readmissions in emergency departments**

Journal:	<i>IIE Transactions on Healthcare Systems Engineering</i>
Manuscript ID	UHSE-2020-0012.R2
Manuscript Type:	Socio-Technical Systems Analysis
Keywords:	Readmission, Health Systems, Emergency Departments, Systems Engineering

SCHOLARONE™  
Manuscripts

## A multi-level stakeholder-centered approach to investigate unnecessary readmissions in emergency departments

### Abstract:

Unnecessary readmissions have become a recurring problem in the Emergency Departments (ED) across the United States. While the current knowledge on the contributors to this problem is dominated by patient-level factors, an understanding of more diverse perspectives across the healthcare organization is needed. This research study provides a multi-level stakeholder-centered view of the problem of readmissions in EDs. Interviews were conducted with 12 relevant stakeholders at different levels of the hierarchy of a representative U.S. healthcare system, including senior leadership, clinical management, and front-line patient care. Thematic analysis was conducted to identify factors that contribute to unnecessary readmissions, and potential strategies to reduce readmissions. The findings revealed eleven potential factors that may contribute to unnecessary ED readmission, including culture, resources constraints, and locality-based factors, among others. Ten potential strategies to reduce readmissions were derived from the interview analysis including, centralized and accessible information, patient education, and coordination with local clinics, among others. Further, a thematic mapping was created to connect the identified factors to the potential strategies. Findings reveal a complex relationship between readmission factors and reduction strategies. Further investigation is needed to validate these findings and to integrate and implement these strategies as bundled interventions in practice.

**Keywords:** Readmissions, emergency departments, health systems engineering, unnecessary admission

## Introduction

In recent years, high patient volume and crowding due to unnecessary readmissions has become a significant issue in Emergency Departments (EDs) across the United States (Jencks, 2010). Unnecessary patient readmissions involve redirecting the limited resources available in the ED to provide care that could have been avoided or administered in another healthcare setting, and therefore contribute to overall operating inefficiencies. Additionally, readmissions have resulted in billions of dollars of expenditure per year, with approximately 20% of the patient readmissions occurring within 30 days of hospital discharge (Jencks et al., 2009). The Hospital Readmission and Reduction Program (HRRP) penalizes hospitals with an excess number of 30-day readmissions (U.S. Centers for Medicare & Medicaid Services, 2020). Given the increasing costs and the implications for patient care, such as longer waiting times to receive medical care due to high patient volume and the impact in the quality of care due to the limited resources available, there is an urgent need to reduce readmissions.

Previous research has looked at outcome and process measures relating to readmissions (Booth and Hux, 2003; Donzé et al., 2013; Hasan et al., 2010; van Walraven et al., 2011). Most studies, however, have used patients' characteristics and social determinants to develop regression-based models to identify predictors of readmission. Patient-related factors identified in these studies include specific patient diagnosis (van Walraven et al., 2011), length of medical follow-up (van Walraven et al., 2011), socioeconomic level (Booth and Hux, 2003), insurance status (Hasan et al., 2010), marital status (Hasan et al., 2010), access to a regular physician (Hasan et al., 2010), the number of prior hospitalizations (Donzé et al., 2013; Hasan et al., 2010), and the length of hospital stay (Donzé et al., 2013; Hasan et al., 2010). These approaches have resulted in effective models based on various process and outcome measures, and patient-level factors to identify predictors to readmissions. However, the role of organizational and systemic factors as potential barriers or facilitators in preventing readmissions is relatively unknown. The investigation of such factors would require a holistic approach to capture the

1  
2  
3 perspectives of relevant stakeholders across the healthcare system to understand factors that may  
4 contribute to readmissions from various lenses.  
5  
6

7 A few studies have elicited the perspectives of physicians regarding patient-centered and hospital-  
8 centered factors that may contribute to readmissions, in addition to strategies to reduce readmissions  
9 (Herzig et al., 2016; Koekkoek et al., 2011; Longman et al., 2011). Physicians perceive that patient-  
10 centered factors such as socioeconomic status (Longman et al., 2011), attitudes towards managing their  
11 medical conditions (Longman et al., 2011), limited awareness of services and ways to access such  
12 services (Longman et al., 2011), inability to self-manage their condition (Herzig et al., 2016), inability to  
13 continue with follow-up care (Herzig et al., 2016), and inadequate social support (Herzig et al., 2016) are  
14 some of the major potential factors that may contribute to patient readmission. However, while  
15 documentation of physicians' perspectives is vital, perception of other stakeholders at the sharp-end (e.g.,  
16 nurses, care coordinators, etc.) of health systems as well as the blunt-end (e.g., hospital and ED  
17 administrators and management) may be needed to draw more holistic conclusions.  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29

30 Similarly, hospital-centered factors that may contribute to readmission have been identified, such  
31 as inappropriate diagnoses, issues at the triage level, and issues of continuity of care and provider  
32 communication post-discharge (Herzig et al., 2016). However, views were limited to physicians.  
33 Identifying diverse perspectives of stakeholders at multiple levels of the healthcare system hierarchy to  
34 obtain a more holistic understanding of factors affecting the problem of unnecessary readmissions  
35 remains a research gap.  
36  
37  
38  
39  
40  
41  
42

43 Researchers have also studied strategies and interventions to reduce readmissions, including in-  
44 hospital programs such as utilization review (Wickizer et al., 1989), informational feedback (Payne et al.,  
45 1991), targeted care bundles (Koehler et al., 2009), the evaluation of the role of health information  
46 exchanges (Kash et al., 2017), the improvement of discharge procedures (Herzig et al., 2016),  
47 improvement in the communication and the coordination between inpatient and outpatient healthcare  
48 providers (Herzig et al., 2016), patient education (Koekkoek et al., 2011), and medication counseling at  
49 discharge (Koekkoek et al., 2011). A systematic review conducted by Hansen et al. (2011) identified  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 interventional studies and classified them into 3 domains based on the patient healthcare process: pre-  
4 discharge (e.g. discharge planning), during the transition of the patient out of the ED (e.g. transition  
5 coaches), and post-discharge (e.g. timely provider follow-up) (Hansen et al., 2011). While the identified  
6 strategies and interventions may serve as the foundation for future inquiries, there is not a clear  
7 understanding of their impact on specific contributors to unnecessary readmissions leaving a gap in  
8 connecting these two bodies of literature.  
9

10  
11  
12  
13  
14  
15  
16         Despite the aforementioned literature, unnecessary readmissions remain a major challenge.  
17  
18 Design of effective strategies and interventions requires a more comprehensive and inclusive view of  
19 healthcare systems that accounts for various sub-systems and stakeholders. Such an approach requires  
20 elicitation of feedback from a wide range of stakeholders at multiple organizational levels, from the  
21 clinical unit to the administration/leadership/senior management. As identified in the literature, the role of  
22 stakeholders at managerial and senior leadership levels can influence quality and safety clinical outcomes,  
23 processes and performance at the clinical unit level (Parand et al., 2014). Additionally, the engagement of  
24 senior leadership in high-level interactions with the medical staff has been identified as a characteristic  
25 that strengthens quality improvement activities within hospitals (Vaughn et al., 2006). Therefore, the  
26 implementation of strategies to reduce readmissions requires a common understanding from stakeholders  
27 at different levels of a healthcare system hierarchy. To our knowledge only one study so far has analyzed  
28 the problem of unnecessary readmissions from a systems perspective. In their study, Acher et al. utilized  
29 the Systems Engineering Initiative for Patient Safety (SEIPS; cf. Carayon et al., 2006) to identify  
30 potential contributors to post-surgery admissions including structure and coordination of the care team,  
31 unplanned discharge preparation, patient expectations and understanding, and problems with the  
32 infrastructure of the EHR (Acher et al., 2015). However, application of a multi-level stakeholder-centered  
33 approach to investigate the growing problem of unnecessary ED readmissions remains a gap.  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50

51  
52         The aim of this study was to utilize a multi-level stakeholder-centered approach by eliciting the  
53 perspectives of stakeholders at multiple levels of a representative healthcare system regarding: (1) factors  
54 that may contribute to unnecessary readmissions, and (2) potential strategies to reduce unnecessary  
55  
56  
57  
58  
59  
60

1  
2  
3 readmissions. The multi-level stakeholder-centered approach adopted in this study allows the analysis of  
4 the problem of unnecessary readmissions by eliciting the perspectives of the top senior leadership level,  
5 healthcare professionals at the operational end of the system, as well as within the ED itself where the  
6 decisions related to admissions are made.  
7  
8  
9  
10

## 11 12 13 **Materials and methods**

### 14 15 16 *Settings*

17  
18 The site for data collection was a large health system in the northeastern region of the United States, one  
19 of the region's largest employers and healthcare providers, comprising several specialty hospitals. Four  
20 hospitals in this system were used as sites for participant recruitment and data collection. The hospitals  
21 ranged from 200 to 300 beds in capacity and served different areas of this metropolitan city (Table 1).  
22  
23  
24  
25  
26

27 [Insert Table 1 here]  
28  
29  
30

### 31 *Approach*

32  
33 Semi-structured interviews were conducted to elicit perspectives of stakeholders, at multiple levels of the  
34 healthcare system hierarchy, on unnecessary readmission problems in the ED. The research team studied  
35 the hierarchical structure of the hospitals by reviewing their organizational charts and developed a  
36 hierarchical model with three main levels within the system hierarchy: (1) Senior leadership level, (2)  
37 Hospital level, and (3) ED level. Hierarchies for individual hospitals varied in structure. For simplicity of  
38 representation, these structures were consolidated into a single generic system hierarchy diagram (Figure  
39 1). The diagram represents the various stakeholders within each level and the key functional relationships  
40 between them across the levels of hierarchy. This representation informed a systematic way to identify  
41 participants for the interviews, with the aim of capturing perspectives from various roles at each level to  
42 cover the breadth and depth of the system. Research received approval from both the hospital's and  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 university's Institutional Review Boards (IRBs). The Consolidated Criteria for Reporting Qualitative  
4  
5 Research (COREQ) guidelines (Tong, Sainsbury, and Craig, 2007) were used for reporting.  
6

7 [Insert Figure 1 here]  
8  
9

### 10 ***Participants***

11  
12 The study targeted participants from each of three system levels of the organization (Figure 1). At the  
13  
14 *Senior Leadership* level, the research team identified the top executive leadership, the divisional  
15  
16 administrative leaders of the different divisions within the healthcare system, and the chiefs of the four  
17  
18 acute care hospitals of the system. At the *Hospital* level, the research team identified system  
19  
20 administrators, chiefs and directors of different departments within the hospitals. Finally, at the  
21  
22 *Emergency Department* level, the research team identified physicians, nurses, care coordinators and triage  
23  
24 personnel as stakeholders of interest. Additionally, since some of the EDs are staffed by an emergency  
25  
26 medicine group that have a single group contract with the healthcare system, stakeholders from this  
27  
28 *Third-Party Contractor* were identified for potential interviews. The recruitment of participants was  
29  
30 carried out by authorized personnel from the healthcare system by email using a snowball sampling  
31  
32 approach, with the objective of recruiting as many participants as possible representing all three levels of  
33  
34 the system hierarchy in each hospital. Three participants had to cancel due to schedule conflicts or clinical  
35  
36 responsibilities.  
37  
38

39  
40 A total of 12 participants were interviewed representing different levels of the healthcare system  
41  
42 hierarchy (roles highlighted in Figure 1). Four participants were stakeholders from the senior level  
43  
44 representing clinician and nurse leadership. Seven participants were interviewed at the hospital level,  
45  
46 whose roles included system administration, nurse management and education, and leadership in  
47  
48 emergency departments of four hospitals within the healthcare system. Six of these participants also had  
49  
50 clinical roles as physicians or nurses in the emergency department, and were therefore also considered as  
51  
52 stakeholders representing the ED level. In addition, a clinical leader who was also a third-party contractor  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 was interviewed. Therefore, a total of seven participants were interviewed who represented the ED level.

4  
5 Further description about the roles of each of the stakeholders interviewed are presented in Table 2.

6  
7 [Insert Table 2 here]

8  
9  
10  
11 ***Interviews***

12  
13 Stakeholders at each of the hierarchical levels were interviewed by a member of the research team (FS)  
14 who is a male, Ph.D. faculty member with extensive training and experience in qualitative research,  
15 accompanied by two members of the healthcare organization where the study was being conducted. The  
16 participants had no prior relationships with the interviewer and were told that the research is in  
17 collaboration with the interviewer's university to address issues with readmissions at the ED. The  
18 interviewer used a research guide to reduce individual biases. The interview guide (refer to Appendix A)  
19 was developed to address the aforementioned gaps in the literature to elicit the interviewees' perspectives  
20 about (1) the problem of unnecessary readmissions in their healthcare organization EDs, (2) the  
21 characteristics that define an unnecessary readmission, (3) the factors that may contribute to unnecessary  
22 readmissions, (4) the potential strategies that are currently used or could be used to reduce unnecessary  
23 readmissions in their organization, and (5) their experience implementing strategies studied in the  
24 literature to mitigate unnecessary readmissions, such as in-hospital management units, patient education,  
25 and collaboration and coordination with other clinical teams. The preliminary guide was formulated based  
26 on review of the relevant literature and identified gaps and then was finalized using a combination of  
27 iterative review sessions with the research team and pilot testing with the collaborators at the health  
28 system under investigation (as suggested by Kallilo et al., 2016). The interviews were conducted in two  
29 rounds, and six participants were interviewed during each round. The first round of interviews was  
30 conducted in March of 2018, and the second round was conducted in July of 2018. The interviews were  
31 carried out in offices located in the facilities of the healthcare system. The interviews were recorded and  
32 field notes were taken by the main interviewer, when necessary. The interview recordings were  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60



1  
2  
3 transcribed for further analysis. Approximately six hours of interviews were recorded and transcribed by  
4  
5 three members of the research team to be used in the qualitative data analysis stage.  
6  
7

### 8 9 *Analysis*

10  
11 A thematic analysis of the interview data based on Braun and Clarke approach (Braun & Clarke, 2006)  
12  
13 was conducted through several stages to identify themes related to the primary categories of interest. The  
14  
15 first stage, known as initial coding, included the identification of a thematic framework comprising a  
16  
17 broad set of initial thematic categories. This was followed by focused coding, in which the data within the  
18  
19 categories identified in the previous stage were coded for themes and sub-themes. The MAXQDA-12  
20  
21 Software (VERBI Software, 2020), including its visualization feature MAXMaps, was used to analyze the  
22  
23 interviews. The analysis was performed primarily by a male single coder (SB) with advanced degrees in  
24  
25 systems engineering, no clinical background or previous experience with the subject matter, and  
26  
27 experienced in content analysis. To reduce the interpretive bias, the codes were discussed with a second  
28  
29 coder (FS) with a Ph.D. in industrial engineering and extensive experience in healthcare research and  
30  
31 qualitative data analysis. In addition, the themes and saturation were discussed with peers with both  
32  
33 academic and clinical backgrounds during monthly project meetings and revised accordingly.  
34  
35  
36 Participants' feedback was not elicited, and no repeat interviews conducted due to limited access.  
37

38  
39 Next, a mapping was done to identify relationships between the various themes across the  
40  
41 categories. Influenced by Braun and Clarke approach for thematic mapping (Braun & Clarke, 2006), the  
42  
43 various themes across the categories were connected following two rules: (1) direct connection: the  
44  
45 participants directly mentioned the connection between themes across the categories, (2) thematic  
46  
47 connection: the underlying message of a theme in one category thematically connect to the underlying  
48  
49 message of a theme in another category. Additionally, the themes were linked to the distinct stakeholders  
50  
51 and their positions in the system hierarchy. This mapping was done to distinguish between perspectives  
52  
53 unique or prominently supported by stakeholders at each hierarchical level, as well as to identify any  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 shared (overlapping) perspectives. Consequently, the sub-themes within each category were distinguished  
4  
5 as either ‘senior level’, ‘hospital and ED level’, or ‘all levels’.  
6  
7

## 8 9 **Results**

10  
11 The initial coding phase resulted in two broad thematic categories: (1) factors that may contribute to  
12  
13 unnecessary readmissions and (2) potential strategies to reduce readmissions. The focused coding stage  
14  
15 resulted in 11 and 10 sub-themes related to each thematic category respectively (Table 3). The sub-  
16  
17 themes, grouped under each category and identified by system hierarchical levels, are described below  
18  
19 with representative quotes from participants at the corresponding levels.  
20

21  
22 [Insert Table 3 here]  
23  
24

### 25 ***Factors that may contribute to unnecessary readmissions – senior leadership level***

26  
27 The following sub-themes relate to factors that may contribute to unnecessary readmissions, as mentioned  
28  
29 predominantly by participants at the senior leadership level or the blunt-end of the system:  
30  
31

#### 32 ***Risk-averse approach to admissions within the healthcare system***

33  
34  
35 Participants at the senior leadership level agreed on the existence of a conservative risk-averse culture  
36  
37 which results in a bias towards more admissions. In particular, participants drew a connection between  
38  
39 risk-aversion and the litigious environment, which caused ED physicians to be defensive-medicine  
40  
41 oriented in their admission decisions and the test and services they order. Participants also reported that in  
42  
43 many cases physicians may take the path of least resistance, since admitting a patient seems to be easier  
44  
45 than arranging for transition of care or home care for patients. The perceived lack of palliative care in the  
46  
47 healthcare system was also reported to add to the length of stay and admissions. Participants also  
48  
49 expressed that economic factors, such as financial incentives, also play a role in admissions leading to an  
50  
51 increase in ambulatory sensitive admissions.  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3       *“The [location] market is notorious for this, as a highly litigious market, which for years did not*  
4       *have a venue rule. Jury members in [location] are highly plaintiff-centric. Doctors got used to*  
5       *being sued, and so the mindset of our ED docs is very defensive-medicine-oriented, both in how*  
6       *they admit and also how they test and utilize service.” - Divisional Administrative Leader 1*  
7  
8  
9

### 10 11 12 13 *Hierarchy and structure in the healthcare system*

14  
15 In the healthcare system under study, all EDs were staffed by contract-based emergency medicine  
16 physicians in addition to physicians who were hospital employees. Stakeholders at the leadership levels  
17 noted that the contracted physicians generally showed less flexibility and willingness to adopt  
18 standardized processes. There was also less interaction between the two physician groups. Consequently,  
19 there were issues related to communication, integration, and coordination, which according to our  
20 participants, may have affected decisions related to admissions and readmissions.  
21  
22  
23  
24  
25  
26  
27

28       *“This group has been together now almost 15 years; however they culturally work independently.*  
29       *They know none of our ED doctors. They work at one campus; none of them flex. They have*  
30       *underinvested in standardization of care and other elements. They’re getting better, but*  
31       *historically they weren’t there.” - Divisional Administrative Leader 1*  
32  
33  
34  
35  
36  
37

### 38 *Physician education*

39  
40 Lack of physician education (e.g., regarding home care options and the steps to follow to arrange the  
41 services with care coordinators) was suggested by stakeholders at the leadership level as a factor that may  
42 contribute to unnecessary readmissions. Participants expressed that in general there is a knowledge deficit  
43 regarding the care options available in the healthcare system other than admitting the patients. In many  
44 cases, physicians do not understand the capabilities of home care or simply have a preference to admit the  
45 patients because it provides them more control over their treatment and outcomes.  
46  
47  
48  
49  
50  
51  
52

53       *“(The) other thing about home care is not everybody understands it or understands its capability.*  
54       *And depending on their own experiences, may or may not want to use it, because they don’t have*  
55  
56  
57  
58  
59  
60

1  
2  
3 *control. In some ways, it's like, 'I'm going to admit this patient, because then I know what's*  
4 *going to happen to them.' But admitting them is not the best thing. Keep them home is better than*  
5 *anything, and home care does so many things. I really think it's a knowledge deficit that they*  
6 *don't know what's available.*” - Divisional Administrative Leader 2  
7  
8  
9  
10  
11  
12  
13

#### 14 ***Factors that may contribute to unnecessary readmissions – hospital & ED level***

15  
16 The following sub-themes relate to factors that may contribute to unnecessary readmissions uniquely  
17 identified or prominently supported by participants at the hospital and ED levels, representing the  
18 stakeholders at the front lines of care:  
19  
20  
21  
22

##### 23 *Resource constraints*

24  
25 Participants described resource constraints related to transition of care along with home care options, as  
26 potential factors that may contribute to unnecessary readmissions. Lack of care coordination resources,  
27 such as nurse case managers and social workers, impedes timely follow-up with primary care physicians,  
28 and ultimately may contribute to readmissions, especially during night shifts. Follow-up care after  
29 patients are discharged is important, and effective and timely care management efforts are needed.  
30  
31 Consequently, participants emphasized that the lack of coordinated efforts with primary care providers  
32 (PCPs) and local clinics, specifically the lack of shared medical information that can help ED physicians  
33 to better manage patients, is a factor which may be leading to readmissions. Additionally, local clinics  
34 have the potential to help with non-critical care, such as IV and antibiotic treatment.  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44

45 *“One thing I always struggle with is that we could have more resources that are available in the*  
46 *ER to setup follow-up care: Social work [and] Case management. That's a big thing in getting*  
47 *people home. I'm taking care of ten patients. I can't do all that. If there's no resources available*  
48 *to help me discharge, in some cases patients end up being admitted.*” - Chief of Emergency  
49  
50  
51  
52  
53 *Department & Physician 1*  
54  
55  
56  
57  
58  
59  
60

### *Policies*

Admission and insurance coverage policies influence admission decisions in the ED. For example, under the “Two-Midnights Rule for Admissions,” also known as the “72-Hours Rule,” Medicare will only cover for up to 72 hours of observation services. After the 72 hours, the physician must file a time extension, or discharge the patient if no additional health care is necessary, or must admit the patient as an inpatient. The latter is what happens on many occasions as a consequence of the time constraints.

*“The system is setup to make it difficult. The 72-hour admission has been a real barrier for getting people to an alternate facility.” - Chief of Emergency Department & Physician 2*

### *Patient education*

Participants at the hospital & ED level suggested that the lack of patient understanding regarding what medical situations require a visit to the ED and what medical situations can be addressed at home, or should be assessed by visiting a primary physician, may contribute to unnecessary visits to the ED. Another issue is patient education regarding the expectancy of stay. One of the issues with additional days added to patient stays is patients not being informed when they are going to be discharged. Patients usually come to know they are being discharged one day prior to, or on the day of discharge. This leads to logistical issues and arrangement problems for the patients, which in certain cases adds to the length of stay.

*“Yeah, that’s another big component. If the patient understands when to come back, you can discharge them. I know that’s an issue at every ED.” - Chief of Emergency Department & Physician 1*

### ***Factors that may contribute to unnecessary readmissions – all levels***

The following sub-themes relate to factors that may contribute to unnecessary readmissions identified and supported by participants at all levels of the hierarchy:

### *Environment and locality-based issues*

Hospitals within the healthcare system have particularities regarding their patient demographics. Hospitals located in affluent areas receive a higher push from the families and patients to be admitted. Somehow patients in these affluent areas have a sense that they know what their clinical issues are and feel that it is the hospital's responsibility to admit them even when they might not need to be admitted. The EDs of hospitals in less affluent areas are usually overcrowded, with tight coupling. Therefore, admission decisions tend to be made under time pressure with a conservative approach due to the highly litigious environment in the area. Hospitals with a predominantly elderly population also tend to confront high admission rate problems.

*"I know a lot of times there is a challenge in the fact that [older adults] may not have the resources they need at home to safely follow-up on those medical concerns. So, they may not have the structure in place and it might not be something that would be as easy to fix in just an hour or two while they are in our department, to get in place those home care services or the follow-up that they would need to be safe at home. So, the physicians feel like it may be most appropriately treated where we are certain they can be safe."* - Nurse Educator

### *Guidelines for physicians*

Some hospitals within the healthcare system have guidelines for certain conditions, such as heart failure and chest pains, but no such guidelines exist for admission decisions. Most of the admission decisions are based on the physician clinical judgement. Participants at the hospital & ED level described concerns regarding the lack of admission guidelines for common diagnoses, and requested guidelines for the top 10 diagnoses within each hospital as well as legal protection for healthcare workers following the guidelines. Participants at the senior leadership level highlighted challenges in implementing such guidelines as a standard practice due to resistance from experienced physicians who feel more comfortable with their own approach and the use of the clinical judgment. However, the participants recognized that the

1  
2  
3 guidelines should not be developed with the intention of substituting clinical judgement, but to be used as  
4  
5 a tool to support the admission decision-making process.  
6

7 *“There is no protection in guidelines and that’s a big issue with physicians. I can have a*  
8 *guideline that says “you have chest pain and you’re under 40 and you have these risk factors”*  
9 *but [if] you don’t meet the admission criteria it doesn’t matter what I think. But if you go home*  
10 *and have a heart attack and die, that guideline does nothing for you. The insurers, the*  
11 *government, nobody has any protection. The government doesn’t want you to admit people or pay*  
12 *for it. They don’t also protect you if you follow their guidelines and send them home.” - Chief of*  
13 *Emergency Department & Physician I*  
14  
15  
16  
17  
18  
19  
20  
21  
22

### 23 *Social determinants of health*

24  
25 Socioeconomic factors play an important role in readmissions as patients who might otherwise need no  
26 medical assistance or could be treated in alternate healthcare settings are admitted for needs other than  
27 medical reasons. A system administrator at the hospital & ED level mentioned that the healthcare system  
28 conducted a small pilot program in one of its hospital with about 10 patients they called the ED super  
29 utilizers. These patients had 25 to 40 combined ED visits in a year, on average. For all of the patients that  
30 participated in the pilot study, the underlying reason for readmission was related to social determinants of  
31 health (electricity, transportation, copays). For example, one of the patients did not have electricity at  
32 home. A nurse case manager visited the participant home and made the arrangement to re-establish the  
33 service. Once the electricity was back on, the participant went from 30 ED visits in a year down to zero.  
34 Similar outcomes were seen after assisting participants that would visit the ED multiple times for reasons  
35 related to lack of resources to cover the copays for medications.  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48

49 *“We started with about ten patients that had probably a combined, on average, ED visits around*  
50 *anywhere from twenty-five ED visits in a year! Some had as many as thirty or forty, so, coming*  
51 *almost every week. And for all of the patients that we looked at, the underlying reason was*  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 *related to social determinants of health: [inability to pay for] electricity, transportation, copays.”*

4  
5 *- System Administrator*

6  
7  
8  
9 *Cultural issues*

10  
11 The litigious environment in the locality, physicians' independent practice-oriented mindset, and  
12 variability in physicians' approach to patient care, are examples of some of the internal cultural factors  
13 identified by participants that may contribute to unnecessary readmissions. These cultural factors include  
14 the fact that due to the litigious environment in the locality, physicians seem to be more risk-averse in  
15 their admission decisions, and once a patient is in the ED a battery of tests is ordered to rule out all  
16 possibilities. This is to be done in the shortest possible time leading to resource constraints. Additionally,  
17 participants suggested that some patients are accustomed to go to specialists instead of primary  
18 physicians, leading to admissions at the tertiary care centers. They also suggested that historically patients  
19 are asked to go to the ED for an on-call doctor without any screening administration system in place (e.g.  
20 telemedicine), also leading to more readmissions.  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31

32 *“In this environment, when someone comes in with the worst headache of their life, I have to CT*  
33 *your head, even though there's nothing that tells me I should. Other places in the country they*  
34 *wouldn't. In other countries, they clearly wouldn't. We don't have a tolerance. We want to do*  
35 *everything we can, in the shortest time period we can to rule out every possibility. I think that's*  
36 *cultural.” - Divisional Administrative Leader 2*  
37  
38  
39  
40  
41  
42  
43

44 *Standardized practice*

45  
46 Participants suggested that the hospital-centric environment causes doctors to be aligned with their  
47 individual hospitals and not the system. The EDs operate differently at each hospital, without  
48 standardization or a standard pathway for treatment. Physicians, in many cases, aligned to their own  
49 practices and experiences, are not receptive to accept and follow standardized practices. Lack of data also  
50 leads to lack of standardization. Specifically, the lack of provision of data to physicians regarding the types  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60



1  
2  
3 of patients, the cost of care, and the outcomes of those patients. Participants suggested that the  
4 implementation of a standard way to decimate information to providers to learn, act and improve outpatient  
5 care would potentially lead to reduction in readmissions.  
6  
7

8  
9 *“...we have four historically hospital-centric environments were the doctors are primarily*  
10 *aligned to their campus and their program and not to the system. And the mindset and the*  
11 *prevailing culture is still independent practice-oriented and not at all systematic or standardized*  
12 *or programmatically-aligned.” - Divisional Administrative Leader 1*  
13 *Potential strategies to*  
14 *reduce readmissions – senior leadership level*  
15  
16  
17  
18  
19  
20  
21

### 22 ***Potential strategies to reduce readmissions – senior leadership level***

23  
24 The following sub-theme relates to potential strategies to reduce readmissions uniquely identified or  
25 prominently supported by participants at the senior leadership level:  
26  
27

#### 28 *Clinical accountability units*

29  
30 One of the methods to reduce readmissions presented to the participants, and prominently supported by  
31 stakeholders at the senior leadership level, is the integration of clinical accountability units, which should  
32 include a shared leadership model at the campus level micro-system along with a leadership model for the  
33 platform, zone, and program levels to improve standardization. The clinical accountability units would  
34 increase the accountability of health professionals by overseeing that they strive for quality of care while  
35 being ethically and financially responsible in their admission and readmission decisions.  
36  
37  
38  
39  
40  
41  
42  
43

44  
45 *“We have our own version of what we call clinical accountability units. We think of them as*  
46 *having three components. They’re programmatically-based, or they’re zone/regional-based, or*  
47 *they’re platform-based - we call them clinical platform work groups.” - Divisional Administrative*  
48 *Leader 1*  
49  
50  
51  
52  
53  
54  
55

### 56 ***Potential strategies to reduce readmissions – hospital & ED level***

1  
2  
3 The following sub-themes relate to potential strategies to reduce readmissions uniquely identified or  
4 prominently supported by participants at the hospital and ED levels, representing the stakeholders at the  
5 front lines of care:  
6  
7  
8

9  
10  
11 *Standardized pathways*

12  
13 Participants suggested the need to develop a handbook to standardize environmental, health and safety  
14 (EHS) care to improve outpatient care, which in turn connects with care transition, social determinants of  
15 health, and care coordination. Participants expressed that in the past, the healthcare system had a different  
16 electronic medical record (EMR) in their EDs compared to inpatient and outpatient units. Therefore, they  
17 lacked the technological infrastructure to easily design, develop, and measure adherence to standard  
18 pathways. It is expected that the recent implementation of an integrated EMR system across the  
19 healthcare system will help facilitate the implementation of standard pathways to care. However,  
20 challenges regarding providers acceptance and adherence to such standard pathways are expected.  
21  
22  
23  
24  
25  
26  
27  
28  
29

30 *“When I talk about those ambulatory sensitive conditions, the thought is that if they had good*  
31 *outpatient treatment, they wouldn’t need to go to the emergency room or be admitted to the*  
32 *hospital. [Healthcare System Name] has developed a handbook to try to standardized EHS care.”*  
33  
34  
35  
36 *- Chief Clinical Officer of Third-Party Contractor*  
37  
38  
39

40 *Primary care physicians (PCPs)/ambulatory catch system*

41  
42 Participants identified the need for an ambulatory system to ‘catch’ or identify patients who need  
43 assistance before admissions in the ED. A challenge perceived by administrators and chiefs of EDs from  
44 the establishment of ambulatory catch systems is the economic investment needed to hire care  
45 coordination resources to identify those patients that may not require admission early in their ED visit,  
46 and redirect them to alternative points of care. This could include timely visits to the PCP, employing  
47 telemedicine, addressing behavioral health determinants, and reinforcing home-visit programs.  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 *“Part of the problem is that a lot of these patients do not have PCPs or that they haven’t been*  
4 *getting medical care. But if they do have a PCP we do call them and say ‘We want to send Mr.*  
5 *Jones home; would you see him in the office tomorrow to check on him?’” - Nurse Manager*  
6  
7  
8  
9

#### 10 *Action plan for conditions*

11  
12  
13 The development of official action plans for some of the avoidable admission cases at the hospitals, such  
14 as action plans for asthma and diabetes education for patients, were mentioned in the interviews. The  
15 participants emphasized the need for simple action plans that can be well understood and promote effective  
16 strategies to support patient’s self-management of their conditions.  
17  
18  
19

20  
21 *“I’ve shown them the asthma action plan, so it’s in our toolbox now. When they interact with*  
22 *patients with asthma, they already have started promoting asthma action plans and conversations*  
23 *with doctors. On diabetes, there’s a lot of opportunity to educate patients on better management*  
24 *of their diabetes.” - Chief Clinical Officer of Third-Party Contractor*  
25  
26  
27  
28  
29  
30

#### 31 **Potential strategies to reduce readmissions – all levels**

32  
33  
34 The following sub-themes relate to potential strategies to reduce readmissions identified by participants at  
35 all levels of the system hierarchy:  
36  
37  
38

#### 39 *Centralized and accessible information*

40  
41  
42 The participants identified the need to collect data about unnecessary readmissions at a granular level and  
43 share that information with the physicians as feedback about the status of the unnecessary readmissions in  
44 their EDs. They suggested the need to identify those patients with recurring visits to the ED and collect  
45 granular information about their clinical conditions, their length of stays, number of readmissions, and the  
46 social determinants of health that could be contributing to their repeated visits. The availability of this  
47 information will not only help physicians in determining the care plan for the patients, but will also help  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 care coordinators to arrange coordinated efforts to address those social and behavioral factors that lead  
4 patients to returns to the EDs.  
5

6  
7 *“I don’t think we have enough granular information about who these patients are, what are their*  
8 *clinical conditions, mapping their length of stays, [and] readmissions. So much opportunity to*  
9 *understand the dynamics. I haven’t seen a good analysis of that yet... I know this is an issue*  
10 *nationally.”- Chief of Hospital 1*  
11  
12  
13  
14

#### 15 16 17 *Patient activation and education* 18

19 Participants from all levels supported the need to enhance patient education so the patients obtain a better  
20 understanding of the management of their conditions, which could lead to reduction in readmissions.  
21 Additionally, they suggested the need to engage patients and caregivers in the discharge process.  
22 Knowledge transfer from the caregivers to patients is important for patient activation for transition from  
23 discharge to ambulatory follow-up.  
24  
25  
26  
27  
28  
29

30 *“We’ve done almost nothing meaningful system-wide in patient advocacy yet. We do patient*  
31 *education and we do some materials, but when it comes to our service lines owning a*  
32 *measurement of patient advocacy, increasing it by 5, 10, 20 percent - how do you measure an*  
33 *activated patient?” - Divisional Administrative Leader 1*  
34  
35  
36  
37  
38  
39

#### 40 *Coordination with local clinics and PCPs* 41

42 Participants from all levels supported the need for efforts in implementing care coordination programs with  
43 PCPs and local clinics in the area. Specifically, they highlighted the need for a health information exchange  
44 pipe with PCPs and specialists. Currently, the healthcare system can access and retrieve patient information  
45 from the hospitals that share the same electronic health record, but cannot get data from any of the other  
46 local clinics and PCPs. Implementing such care coordination programs with PCPs and local clinics in the  
47 area would require (1) the establishment of effective channels of communication between the patient and  
48 PCP, (2) the creation of a system for follow-up appointments with primary care clinician and specialists for  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 the patients across hospital, and (3) the transfer information regarding patient post-discharge care in a timely  
4 and effective way to PCPs and post-discharge care units.  
5

6  
7 *“I think this experience with our ED superutilizer was really key, and I think the next step is to*  
8 *think about starting with a really engaged PCP. And so now the sense is how do you scale that?*  
9 *How do you do that for, you know a hundred patients? Do you bring the PCP in? I think it’s*  
10 *critical to have the PCP engaged in these conversations, so we are trying to figure out how to*  
11 *actually scale that model across all of the PCPs.” - System Administrator*  
12  
13  
14  
15  
16  
17

### 18 19 *Home visits*

20  
21 Participants from all levels supported the establishment of home visit programs easily available to patients  
22 to reduce unnecessary readmissions. They emphasized the need to educate eligible patients about the  
23 existence and benefits of being enrolled in such programs. They also highlighted the need to educate  
24 physicians about home visits as an alternative of care, in addition to facilitate the coordination of such  
25 services so physicians do not perceive its arrangement as a burden. Participants suggested that establishing  
26 an effective home visits program will require setup and resources for a home care company.  
27  
28  
29  
30  
31  
32  
33

34 *“We have a home care company and there are other companies that offer services. If we could*  
35 *figure out a way to do a better job of making sure those services were available easily, we could*  
36 *set them up, we could have good resources there you know in a different way would be helpful.” -*  
37  
38  
39  
40  
41 *Chief of Hospital 2*  
42  
43

### 44 *Checklists*

45  
46 Checklists help in the standardization of care across all hospitals, in addition to its usefulness to decrease  
47 error and improve patient and process outcomes. The hospitals within the healthcare system used to have  
48 a simple checklist to address the need of complex patients. However, participants noted that the current  
49 electronic health record system presented challenges to incorporating checklists.  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 *“We used what AHRQ had related to addressing complex patients. And it was a simple checklist*  
4 *around their needs. And then, we also mapped that onto, what wasn't, which was challenging,*  
5 *what we had in NextGen to capture kind of our ongoing. But NextGen was not good for it. So now*  
6 *I'm trying to figure out how we can do it in EPIC.” - System Administrator*  
7  
8  
9  
10  
11  
12

### 13 *Unscheduled care system*

14  
15 Participants suggested the creation of new urgent care centers as an alternative to the ED, in addition to  
16 increasing care coordination resources in the ED to take care of unscheduled care patients. At the moment  
17 this study was conducted, the healthcare system had opened a newer urgent care center located between  
18 two of its hospitals. The urgent care center provided advanced urgent care options - day hospital options,  
19 such as intravenous therapy, multiple test alternatives, and wound care treatment, among other services.  
20 The urgent care center was intended to be a natural alternative to the ED, but at the moment of this study  
21 its utilization was slow and hasn't quite had any appreciable impact yet.  
22  
23  
24  
25  
26  
27  
28  
29

30 *“I think it just need a strong partnership with our social work team and the members of the*  
31 *healthcare team that can help arrange some of those needs to be met in the home.” -Nurse*  
32 *Educator*  
33  
34  
35  
36  
37

### 38 ***Relationships between sub-themes***

39  
40 The mapping presented in Figure 2 visualizes the relationships between factors that may  
41 contribute to unnecessary readmissions, the potential strategies to reduce readmissions, and the  
42 stakeholders' perspectives within the system hierarchy. The connection between a factor and a strategy  
43 was identified based on participants' responses discussing the corresponding themes, following the two  
44 established aforementioned rules. The thickness of the lines shows the prominence of certain sub-themes  
45 based on the number of participant-quotes (or evidence) to which they were related. The mapping  
46 provides a summarized representation of the interviewed stakeholders' perspectives which could inform  
47 the implementation of process improvement interventions and further investigation as discussed below.  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

[Insert Figure 2 here]

As shown in Figure 2, each potential strategy was linked with multiple factors. For instance, the need for *centralized and accessible information* to avoid missing information, which emerged as the most prominent sub-theme under strategies could potentially reduce readmissions by addressing aspects related to seven factors. These include addressing environment and locality-based factors by facilitating the identification of hospitals with prevalent and recurring readmissions issues, in addition to identifying the patients within the system with higher incidence of repeated visits. Identifying this information at a more granular level could also assist in identifying the reasons for the patients' frequent visits to the ED. For example, issues associated to social determinants of health could be addressed for those patients that end up being readmitted due to socioeconomic factors. Additionally, having centralized and accessible information about readmissions could serve as a way to support the standardization of practice within the overall healthcare system. Finally, this strategy has the potential to improve the standardization of processes within each individual sub-system (hospital), by facilitating the development of a shared mental model between physician groups (contract-based emergency medicine physicians and the physicians who are hospital employees), potentially influencing their approaches to admissions.

Such visual mapping also supports the identification of potential strategies for an individual factor of interest. For instance, resource constraints in the EDs, which emerged as the most prominent sub-theme under the perceived factors that may contribute to unnecessary readmission, can be mapped to seven potential strategies to reduce readmissions. For example, the implementation of ambulatory catch systems could relieve the need for care coordination resources in the EDs by providing alternatives for early diagnosis and prevention, avoiding potential repeated visits. Also, creating coordination programs with local clinics and PCPs, and the implementation of unscheduled care systems, could lever the load of the limited care coordination resources in the EDs by sharing efforts with other healthcare organizations.

## Discussion

Semi-structured interviews were conducted with a wide range of stakeholders at different levels of a large health system: chief of EDs, nurses, and administrators at the hospital & ED level, and divisional administrative leaders and chiefs of hospitals at the senior leadership level. The thematic analysis of the stakeholders' interviews identified relevant sub-themes under two main categories: factors that may contribute to unnecessary readmissions, and potential strategies to reduce readmissions.

### *Utility of a multi-level stakeholder-centered approach to identify perceived factors that may contribute to readmission*

Results from the study show that while stakeholders at different levels of the system hierarchy identified similar factors that may contribute to unnecessary readmissions and potential strategies to reduce readmissions, several factors and strategies are unique to particular experiences and viewpoints at specific levels of the system hierarchy. For example, while stakeholders showed a common understanding of social, cultural, locality-based, and practice-based factors that may contribute to unnecessary readmissions, at the hospital and ED level, concerns are more biased towards operational factors that affect day-to-day decisions such as the need for more care coordination resources, policies, and patient education. On the other hand, stakeholders at the senior leadership level were more concerned with the organizational level factors regarding the structure of the healthcare system and the front-line care team's approach to admission. Understanding these similarities and differences could facilitate better communication across different levels of the system hierarchy towards a shared understanding of factors and strategies, which is essential to promote effective and accepted system-wide interventions as well as collective efforts integral to the achievement of a better healthcare delivery system (National Academy of Engineering and Institute of Medicine, 2005).

Having interviews with stakeholders at three different levels of a healthcare system hierarchy also provided the opportunity to identify potential contributing factors, which has not been highlighted in previous studies about unnecessary readmissions. The findings of this study suggest that significant



1  
2  
3 variability within the elements of a large health system and in particular their internal culture, policies,  
4 and lack of standardized practice impact readmissions decisions. An implication of such heterogeneity  
5 across several parts of the healthcare system is that the physicians align their workflows with their micro-  
6 system (e.g., an individual hospital) rather than the system as a whole. Low interaction between the  
7 contract-based emergency medicine physicians and the system-employed physicians exacerbates this  
8 heterogeneity across several parts of the healthcare system. The culture of professional autonomy and low  
9 initiatives of team-based care not only limits the opportunity to establish standardized procedures, but  
10 also have been identified as a challenge for change management in many organizations (National  
11 Academy of Engineering and Institute of Medicine, 2005). Interventions to address these issues need to  
12 be implemented at the hospital level, but will require support from all levels of the healthcare system.  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23

24 Many of our findings align with patient-centered and hospital-centered factors and strategies  
25 identified in previous studies. For example, factors related to social determinants of health, e.g. at the  
26 socioeconomic level, have been documented as patient-related contributors to readmission (Booth and  
27 Hux, 2003; Longman et al., 2011). Additionally, hospital-centered factors that may contribute to  
28 unnecessary readmissions such as issues of continuity of care and provider communication post-  
29 discharge, as identified in previous studies (Herzig et al., 2016), are in line with our findings about the  
30 lack of care coordination resources to arrange timely follow-up for patients post-discharge. Lack of  
31 patient education on self-management was found to be a significant factor that may contribute to  
32 unnecessary readmissions. While this is in line with findings in the literature (Herzig et al., 2016;  
33 Koekkoek et al., 2011), stakeholders interviewed at the hospital and ED levels highlighted the importance  
34 of focused educational efforts about specific medical situations that require a visit to the ED, versus those  
35 situations that can be addressed at home or that should be assessed by visiting a PCP to make better use of  
36 the resources in the ED. In addition, our findings show that ED physicians and hospitalists can benefit  
37 from education on alternatives available in the hospital other than patient admission, as well as access to  
38 practical admission guidelines to support decision-making. However, further investigation is required  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 regarding the design of such guidelines to meet physicians' needs and the development of policies to  
4 protect physicians' decisions made using such guidelines.  
5  
6

### 7 8 9 ***Reducing unnecessary readmissions***

10 Potential strategies to reduce readmissions emerged from the stakeholder's interviews. Some of the  
11 strategies proposed by the stakeholders require system-wide efforts to be implemented within and across  
12 the different hospitals in the healthcare system. These include the creation of standardized pathways and  
13 clinical accountability units, the centralization and accessibility of information, patient education and  
14 activation, the creation of support documentation for patients and physicians (e.g. action plans and  
15 admission guidelines), the implementation of home visit programs, and the arrangement of timely follow-  
16 up for patients' post-discharge. Some of our findings are consistent with those of other studies that have  
17 identified primarily within-system strategies to reduce readmission, such as the integration of health  
18 information exchange to make patient information more centralized and accessible (Kash et al., 2017),  
19 and the reinforcement of patient education and activation (Koekkoek et al., 2011).  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31

32 While the aforementioned within-system interventions have the potential of reducing unnecessary  
33 readmissions, findings from this study show the need for other interventions that would require efforts in  
34 collaboration with sources and entities outside the health system, such as the implementation of care  
35 coordination programs with PCPs and local clinics, the creation of unscheduled care vehicles (e.g. urgent  
36 care facilities), and the implementation of ambulatory catch systems (e.g. telehealth). The implementation  
37 of care coordination programs with PCPs and local clinics will require outreach initiatives to maintain an  
38 effective pipeline of communication between the different healthcare organizations to assure the  
39 arrangement of timely follow-up for patients and the appropriate exchange of patients' health information.  
40 While health information exchange has been identified as a critical intervention to potentially reduce  
41 readmissions, literature shows low integration of this tool in hospitals due to challenges such as the need  
42 of interoperability standards and providers collaboration in sharing patient information (Kash et al.,  
43 2017). Telehealth has been identified as a feasible ambulatory catch method to be used in emergency  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 departments to provide urgent critical care, especially to patients in underserved and rural areas (Brennan  
4 et al., 1999; Heath et al., 2009; Young et al., 2018). However, while the potential of telehealth to provide  
5 early diagnosis and intervention makes it a promising tool to reduce readmissions in EDs, further research  
6 is warranted to assess its effectiveness given the gap in implementation of such technologies as a care  
7 transition intervention (Kripalani et al., 2014).  
8  
9  
10  
11  
12

13  
14 Using Hansen et al. (2011) classification of interventions, the implementation of strategies to  
15 reduce readmissions can be established in three phases: pre-discharge, during the transition of the patient  
16 out of the ED, and post-discharge, in order to decrease the chance of an unnecessary readmission. Pre-  
17 discharge interventions may include discharge planning, patient education, and timely and effective care  
18 coordination efforts. For example, findings from research studies suggest that filling out patient  
19 medication prior to discharge contributes to reduced readmissions (Hiteshew et al., 2012; Kenyon et al.,  
20 2015). Interventions bridging the transition may include integrating transition coaches, providing  
21 continuity of care, and standardizing the discharge procedures in the ED. Engaging patients in the  
22 discharge process, with knowledge transfer from caregiver to patient, is important for patient activation  
23 for transition from discharge to ambulatory follow-up (Hansen et al., 2011). Post-discharge interventions  
24 may include timely follow-up, care coordination with the primary physician, implementation of  
25 telemedicine systems, establishment of patient hotlines, and reinforcement of the home visits programs.  
26 Research shows that bundle interventions such as post-discharge follow-up calls and Patient-Centered  
27 Data Input (PCDI) can reduce readmissions by anywhere between 3.6% and 28% (Coleman et al., 2006;  
28 Koehler et al., 2009; Naylor et al., 1994).  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46

### 47 ***Methodological contributions***

48  
49 In our study we used two novel techniques to improve the system-wide elicitation of views and synthesis  
50 of findings from a multi-level stakeholder-centered perspective. First, we developed a system hierarchy  
51 diagram to inform our selection of participants such that representative views covering the depth and  
52 breadth of the healthcare system are included (Figure 1). In order to develop such system representation,  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 we requested access to the healthcare system's organizational (org) charts. To our surprise, several  
4 entities within the system did not have a comprehensive system-wide org chart. Further investigation  
5 showed that several other large health systems also lack such system-wide visual representation. While  
6 compilation of such hierarchical representation was challenging, this approach helped develop a holistic  
7 view of the problem of unnecessary readmissions in EDs that accounted for a wide range of stakeholders'  
8 views.  
9

10  
11  
12  
13  
14  
15  
16 Second, a bipartite network representation was used to investigate how the identified factors that  
17 may contribute to unnecessary readmissions were related to the set of potential strategies to reduce  
18 readmissions based on stakeholders' feedback (Figure 2). Using this mapping method as an investigation  
19 tool may lay the foundation to investigate factors that may contribute to the problem of unnecessary  
20 readmissions and the potential strategies to reduce readmissions, and provide the opportunity to visualize  
21 how the perspectives of stakeholders at different levels of the system hierarchy are interrelated. One of  
22 the limitations of this method is that, while one or more factors can be addressed by the same strategy,  
23 that strategy might depend upon other strategies to work efficiently. For instance, creating efficient  
24 programs in coordination with local clinics and PCPs would depend upon having standardized pathways  
25 of practice in place, in addition to having centralized and accessible information. Therefore, further  
26 investigation is needed to identify ways for integration and implementation of these strategies as bundled  
27 interventions in practice.  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42

### 43 ***Limitations***

44  
45 Due to similarities in the structure of large health systems in United States, many of the findings of this  
46 research may be applicable to other systems. However, our collective experience shows that one-size-fits-  
47 all solutions are rarely effective without context-specific considerations. Therefore, the methodological  
48 approaches to investigate readmissions should be adapted to the specific needs and characteristics of  
49 different organizational structures.  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 An important limitation of this research is the small sample size. Despite our effort in using a  
4 multi-level stakeholder-centered approach to involve representative views from across the health system  
5 under investigation, perspectives of additional relevant stakeholders evenly distributed across different  
6 levels of system hierarchy is needed to improve generalizability of findings. However, in line with  
7 Malterud's (2016) guidelines, the narrow aim of our study, the involvement of participants with  
8 characteristics highly specific to the study aim, the rich data obtained from the quality dialogue with the  
9 interviewees, and the in-depth qualitative data analysis conducted, ensured a relatively rich dataset for the  
10 scope of the inquiry. In addition, several prevalent issues identified in the analysis were related to the lack  
11 of care coordination resources for helping in the discharge process and the coordination of timely follow-  
12 up for patients. Therefore, future interviews should expand on issues related to care coordination  
13 resources, and elicit perspectives from additional stakeholders such as social workers and nurse case  
14 managers.  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27

28 Unnecessary readmissions have become a recurring problem in the EDs of hospitals across the  
29 United States, resulting in operational inefficiencies and financial constraints. Additional studies are  
30 warranted to fully understand the characteristics and components of admissions in EDs and identify the  
31 factors that may contribute to repeated patient visits. The findings from our multi-level stakeholder-  
32 centered approach informed by systems engineering methods introduced in this discussion may inform  
33 the development of practical and sustainable mitigation strategies to reduce unnecessary readmissions.  
34  
35  
36  
37  
38  
39  
40  
41  
42

### 43 **Acknowledgements**

44  
45 The preparation of this article is based on work supported by the National Science Foundation (NSF)  
46 under grant no. IIP-0832439. Findings and conclusions in this material are those of the authors and do not  
47 necessarily reflect the views of the NSF. We would like to thank Arjun Rao for his assistance with data  
48 collection and Jacob Kolman for his assistance with editing the manuscript.  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

### Declaration of interests

None to report

### References

- Acher, A. W., LeCaire, T. J., Hundt, A. S., Greenberg, C., Carayon, P., Kind, A. J., and Weber, S. M. (2015) A human factors and systems engineering evaluation of readmission following complex surgery. *Journal of the American College of Surgeons*, **221**(4), 810–820. <https://doi.org/10.1016/j.jamcollsurg.2015.06.014>
- Booth, G. L., and Hux, J. E. (2003) Relationship between avoidable hospitalizations for diabetes mellitus and income level. *Archives of Internal Medicine*, **163**(1), 101–106. <https://doi.org/10.1001/archinte.163.1.101>
- Braun, V., and Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology*, **3**(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Brennan, J. A., Kealy, J. A., Gerardi, L. H., Shih, R., Allegra, J., Sannipoli, L., and Lutz, D. (1999) Telemedicine in the emergency department: A randomized controlled trial. *Journal of Telemedicine and Telecare*, **5**(1), 18–22. <https://doi.org/10.1258/1357633991932342>
- Carayon, P., Hundt, A. S., Karsh, B.-T., Gurses, A. P., Alvarado, C. J., Smith, M., and Brennan, P. F. (2006) Work system design for patient safety: The SEIPS model. *BMJ Quality & Safety*, **15**(suppl 1), i50–i58. <https://doi.org/10.1136/qshc.2005.015842>
- Coleman, E. A., Parry, C., Chalmers, S., and Min, S.-J. (2006) The care transitions intervention: Results of a randomized controlled trial. *Archives of Internal Medicine*, **166**(17), 1822–1828. <https://doi.org/10.1001/archinte.166.17.1822>
- Donzé, J., Aujesky, D., Williams, D., and Schnipper, J. L. (2013) Potentially avoidable 30-day hospital readmissions in medical patients: Derivation and validation of a prediction model. *JAMA Internal Medicine*, **173**(8), 632–638. <https://doi.org/10.1001/jamainternmed.2013.3023>

- 1  
2  
3 Hansen, L. O., Young, R. S., Hinami, K., Leung, A., and Williams, M. V. (2011) Interventions to reduce  
4 30-day rehospitalization: A systematic review. *Annals of Internal Medicine*, **155**(8), 520–528.  
5  
6 <https://doi.org/10.7326/0003-4819-155-8-201110180-00008>  
7  
8  
9 Hasan, O., Meltzer, D. O., Shaykevich, S. A., Bell, C. M., Kaboli, P. J., Auerbach, A. D., Wetterneck, T.  
10 B., Arora, V. M., Zhang, J., and Schnipper, J. L. (2010) Hospital readmission in general medicine  
11 patients: A prediction model. *Journal of General Internal Medicine*, **25**(3), 211–219.  
12  
13 <https://doi.org/10.1007/s11606-009-1196-1>  
14  
15  
16 Heath, B., Salerno, R., Hopkins, A., Hertzog, J., and Caputo, M. (2009) Pediatric critical care telemedicine  
17 in rural underserved emergency departments\*. *Pediatric Critical Care Medicine*, **10**(5), 588.  
18  
19 <https://doi.org/10.1097/PCC.0b013e3181a63eac>  
20  
21  
22 Herzig, S. J., Schnipper, J. L., Doctoroff, L., Kim, C. S., Flanders, S. A., Robinson, E. J., Ruhnke, G. W.,  
23 Thomas, L., Kripalani, S., Lindenauer, P. K., Williams, M. V., Metlay, J. P., and Auerbach, A. D.  
24 (2016) Physician perspectives on factors contributing to readmissions and potential prevention  
25 strategies: A multicenter survey. *Journal of General Internal Medicine*, **31**(11), 1287–1293.  
26  
27 <https://doi.org/10.1007/s11606-016-3764-5>  
28  
29  
30  
31  
32  
33 Hiteshew, K. J., Franz, T., Lamberjack, K., and Chen, A. M. H. (2012) Don't Leave Without Them:  
34 Dispensing asthma medications to pediatric patients upon discharge is associated with decreased  
35 hospital readmissions. *INNOVATIONS in Pharmacy*, **3**(4). <https://doi.org/10.24926/iip.v3i4.279>  
36  
37  
38  
39  
40  
41 Jencks, S. F. (2010) Defragmenting care. *Annals of Internal Medicine*, **153**(11), 757–758.  
42  
43 <https://doi.org/10.7326/0003-4819-153-11-201012070-00010>  
44  
45  
46 Jencks, S. F., Williams, M. V., & Coleman, E. A. (2009) Rehospitalizations among patients in the medicare  
47 fee-for-service program. *New England Journal of Medicine*, **360**(14), 1418–1428.  
48  
49 <https://doi.org/10.1056/NEJMsa0803563>  
50  
51  
52 Kallio, H., Pietilä, A. M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review:  
53 Developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced*  
54 *Nursing*, **72**(12), 2954-2965.  
55  
56  
57  
58  
59  
60



- 1  
2  
3 Kash, B. A., Baek, J., Davis, E., Champagne-Langabeer, T., and Langabeer, J. R. (2017) Review of  
4 successful hospital readmission reduction strategies and the role of health information exchange.  
5  
6 *International Journal of Medical Informatics*, **104**, 97–104.  
7  
8 <https://doi.org/10.1016/j.ijmedinf.2017.05.012>  
9  
10  
11 Kenyon, C. C., Rubin, D. M., Zorc, J. J., Mohamad, Z., Faerber, J. A., and Feudtner, C. (2015) Childhood  
12 asthma hospital discharge medication fills and risk of subsequent readmission. *The Journal of*  
13 *Pediatrics*, **166**(5), 1121–1127. <https://doi.org/10.1016/j.jpeds.2014.12.019>  
14  
15  
16 Koehler, B. E., Richter, K. M., Youngblood, L., Cohen, B. A., Prengler, I. D., Cheng, D., and Masica, A.  
17 L. (2009) Reduction of 30-day postdischarge hospital readmission or emergency department (ED)  
18 visit rates in high-risk elderly medical patients through delivery of a targeted care bundle. *Journal*  
19 *of Hospital Medicine*, **4**(4), 211–218. <https://doi.org/10.1002/jhm.427>  
20  
21  
22 Koekkoek, D., Bayley, K. B., Brown, A., and Rustvold, D. L. (2011) Hospitalists assess the causes of early  
23 hospital readmissions. *Journal of Hospital Medicine*, **6**(7), 383–388.  
24  
25 <https://doi.org/10.1002/jhm.909>  
26  
27  
28 Kopach-Konrad, R., Lawley, M., Criswell, M., Hasan, I., Chakraborty, S., Pekny, J., and Doebbeling, B.  
29 N. (2007) Applying systems engineering principles in improving health care delivery. *Journal of*  
30 *General Internal Medicine*, **22**(Suppl 3), 431–437. <https://doi.org/10.1007/s11606-007-0292-3>  
31  
32  
33 Kripalani, S., Theobald, C. N., Anctil, B., and Vasilevskis, E. E. (2014) Reducing hospital readmission:  
34 current strategies and future directions. *Annual Review of Medicine*, **65**, 471–485.  
35  
36 <https://doi.org/10.1146/annurev-med-022613-090415>  
37  
38  
39 Longman, J. M., Singer, J. B., Gao, Y., Barclay, L. M., Passey, M. E., Pirotta, J. P., Heathcote, K. E., Ewald,  
40 D. P., Saberi, V., Corben, P., and Morgan, G. G. (2011) Community based service providers'  
41 perspectives on frequent and/or avoidable admission of older people with chronic disease in rural  
42 NSW: A qualitative study. *BMC Health Services Research*, **11**, 265. [https://doi.org/10.1186/1472-](https://doi.org/10.1186/1472-6963-11-265)  
43 [6963-11-265](https://doi.org/10.1186/1472-6963-11-265)  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60



- 1  
2  
3 Malterud, K., Siersma, V. D., & Guassora, A. D. (2016). Sample size in qualitative interview studies: guided  
4 by information power. *Qualitative Health Research*, **26**(13), 1753–1760.  
5  
6 <https://doi.org/10.1177/1049732315617444>  
7  
8  
9 National Academy of Engineering and Institute of Medicine. (2005) *Building a Better Delivery System: A*  
10 *New Engineering/Health Care Partnership* (P. P. Reid, W. D. Compton, J. H. Grossman, & G.  
11 Fanjiang, Eds.). National Academies Press (US). <http://www.ncbi.nlm.nih.gov/books/NBK22832/>  
12  
13  
14 Naylor, M., Brooten, D., Jones, R., Lavizzo-Mourey, R., Mezey, M., and Pauly, M. (1994) Comprehensive  
15 discharge planning for the hospitalized elderly. A randomized clinical trial. *Annals of Internal*  
16 *Medicine*, **120**(12), 999–1006. <https://doi.org/10.7326/0003-4819-120-12-199406150-00005>  
17  
18  
19  
20 Parand, A., Dopson, S., Renz, A., & Vincent, C. (2014). The role of hospital managers in quality and patient  
21 safety: A systematic review. *BMJ Open*, **4**(9). <https://doi.org/10.1136/bmjopen-2014-005055>  
22  
23  
24 Payne, S. M. C., Ash, A., and Restuccia, J. D. (1991) The role of feedback in reducing medically  
25 unnecessary hospital use. *Medical Care*, **29**(8), AS91–AS106. JSTOR.  
26  
27  
28  
29  
30 Tong A., Sainsbury P., Craig J. (2007) Consolidated criteria for reporting qualitative research (COREQ): a  
31 32-item checklist for interviews and focus groups. *International Journal for Quality in Health*  
32 *Care*, **19**(6), 349 – 357.  
33  
34  
35  
36  
37 U.S. Centers for Medicare & Medicaid Services. (2020) *Hospital Readmissions Reduction Program*  
38 *(HRRP)*. Centers for Medicare and Medicaid Services. [https://www.cms.gov/Medicare/Quality-](https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/HRRP/Hospital-Readmission-Reduction-Program)  
39 [Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/HRRP/Hospital-Readmission-](https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/HRRP/Hospital-Readmission-Reduction-Program)  
40 [Reduction-Program](https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/HRRP/Hospital-Readmission-Reduction-Program)  
41  
42  
43  
44  
45 van Walraven, C., Bennett, C., Jennings, A., Austin, P. C., and Forster, A. J. (2011) Proportion of hospital  
46 readmissions deemed avoidable: A systematic review. *Canadian Medical Association Journal*,  
47 **183**(7), E391-402. <https://doi.org/10.1503/cmaj.101860>  
48  
49  
50  
51 Vaughn, T.E., Koepke, M., Kroch, E., Lehrman, W.G., Sinha, S., and Levey, S. (2006). Engagement of  
52 leadership in quality improvement initiatives: executive quality improvement survey results.  
53 *Journal of Patient Safety*, **2**(1), 2-9.  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 VERBI Software. (2020) MAXQDA [software]. VERBI Software GmbH, Berlin, Germany.

4  
5 <https://www.maxqda.com/>

6  
7 Wickizer, T. M., Wheeler, J. R., and Feldstein, P. J. (1989) Does utilization review reduce unnecessary

8  
9 hospital care and contain costs? *Medical Care*, **27**(6), 632–647. [https://doi.org/10.1097/00005650-](https://doi.org/10.1097/00005650-198906000-00006)

10  
11 [198906000-00006](https://doi.org/10.1097/00005650-198906000-00006)

12  
13 Young, K., Gupta, A., and Palacios, R. (2018) Impact of telemedicine in pediatric postoperative care.

14  
15 *Telemedicine Journal and E-Health*. <https://doi.org/10.1089/tmj.2018.0246>

16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

For Peer Review Only

**Table 1.** Description of the hospitals within the healthcare system

HOSPITAL	DESCRIPTION
<b>Hospital 1</b>	Acute-care teaching hospital with a capacity of 287 beds. The hospital offers a full range of services including cancer care, orthopedic care, cardiovascular care, and maternity care, among other services.
<b>Hospital 2</b>	Acute-care hospital with a capacity of 231 beds. The hospital offers a full range of comprehensive services and programs including maternity care, orthopedic care, and cardiovascular care, among other services. The hospital counts with first celiac center in the suburbs of the city, and the county's only trauma center.
<b>Hospital 3</b>	Acute-care hospital and medical complex with a capacity of 331 beds. Located in a suburban area at the outside western city limits, the hospital offers a full range of services including a level two trauma center, a colorectal center, and a brain and spine center, among other services.
<b>Hospital 4</b>	Acute-care hospital with a capacity of 204 beds. The hospital offers a full range of services including maternity care, orthopedic care, and cardiovascular care, among other services. The hospital counts with a chest pain center and stroke center in its emergency department.

**Table 2.** Description of the Stakeholders Interviewed

HIERARCHY LEVEL	STAKEHOLDER	DESCRIPTION
Senior Leadership	Divisional Administrative Leader (1) - All 4 Hospitals	Senior Vice President and Chief Medical Officer in the healthcare system with extensive experience as a general internal medicine practitioner.
	Divisional Administrative Leader (2) - All 4 Hospitals	Senior Vice President of patient services and the Chief Nursing Officer in the healthcare system with more than 30 years of nursing experience.
	Chief - Hospital 1	President of one of the hospitals within the healthcare system with more than 30 years of experience in health care and hospital administration.
	Chief - Hospital 2	President of one of the hospitals within the healthcare system with more than 25 years of experience in health care systems management and operation.
Hospital & ED Level	System Administrator – Hospital 3	Associate system administrator of one of the hospitals within the healthcare system with extensive experience in public health and business administration.
	Nurse Manager - Hospital 3	Emergency Department nurse manager with a master of science in nursing and extensive experience as a certified emergency nurse.

	Nurse Educator - Hospital 3	Emergency Department nurse educator with a master of science in nursing and extensive experience as a certified emergency nurse.
	Chief of Emergency Department & Physician 1 – Hospital 4	Chief of Emergency Department of one of the hospitals within the healthcare system, with more than 20 years of experience as an emergency medicine specialist.
	Chief of Emergency Department & Physician 2 – Hospital 1	Chief of Emergency Department of one of the hospitals within the healthcare system, with more than 30 years of experience as an emergency medicine specialist.
	Chief of Emergency Department & Physician 3 – Hospital 2	Chief of Emergency Department of one of the hospitals within the healthcare system, with more than 20 years of experience as an emergency medicine specialist.
	Chief of Emergency Department & Physician 4 – Hospital 2	Chief of Emergency Department of one of the hospitals within the healthcare system, with more than 20 years of experience as an emergency medicine specialist.
	Chief Clinical Officer - Third Party Contractor – All 4 Hospitals	Family physician with an extensive career in clinical practice, teaching and healthcare leadership, who serves as the Chief Clinical Officer of a third-party contractor that provide services to the healthcare system.

**Table 3.** Sub-themes resulting from the focused coding stage

	POTENTIAL FACTORS	POTENTIAL STRATEGIES
<b>ALL LEVELS</b>	<ol style="list-style-type: none"> <li>1. Environment and locality-based issues</li> <li>2. Guidelines for physicians</li> <li>3. Social determinants of health</li> <li>4. Cultural issues</li> <li>5. Standardized practice</li> </ol>	<ol style="list-style-type: none"> <li>1. Centralized and accessible information</li> <li>2. Patient activation and education</li> <li>3. Coordination with local clinics and PCPs</li> <li>4. Home visits</li> <li>5. Checklists</li> <li>6. Unscheduled care system</li> </ol>
<b>SENIOR LEADERSHIP</b>	<ol style="list-style-type: none"> <li>1. Risk-averse approach to admissions within the healthcare system</li> <li>2. Hierarchy and structure in the healthcare system</li> <li>3. Physician education</li> </ol>	<ol style="list-style-type: none"> <li>1. Clinical accountability units</li> </ol>
<b>HOSPITAL &amp; ED</b>	<ol style="list-style-type: none"> <li>1. Resource constraints</li> <li>2. Policies</li> <li>3. Patient education</li> </ol>	<ol style="list-style-type: none"> <li>1. Standardized pathways</li> <li>2. Primary care physicians (PCPs)/ambulatory catch system</li> <li>3. Action plan for conditions</li> </ol>

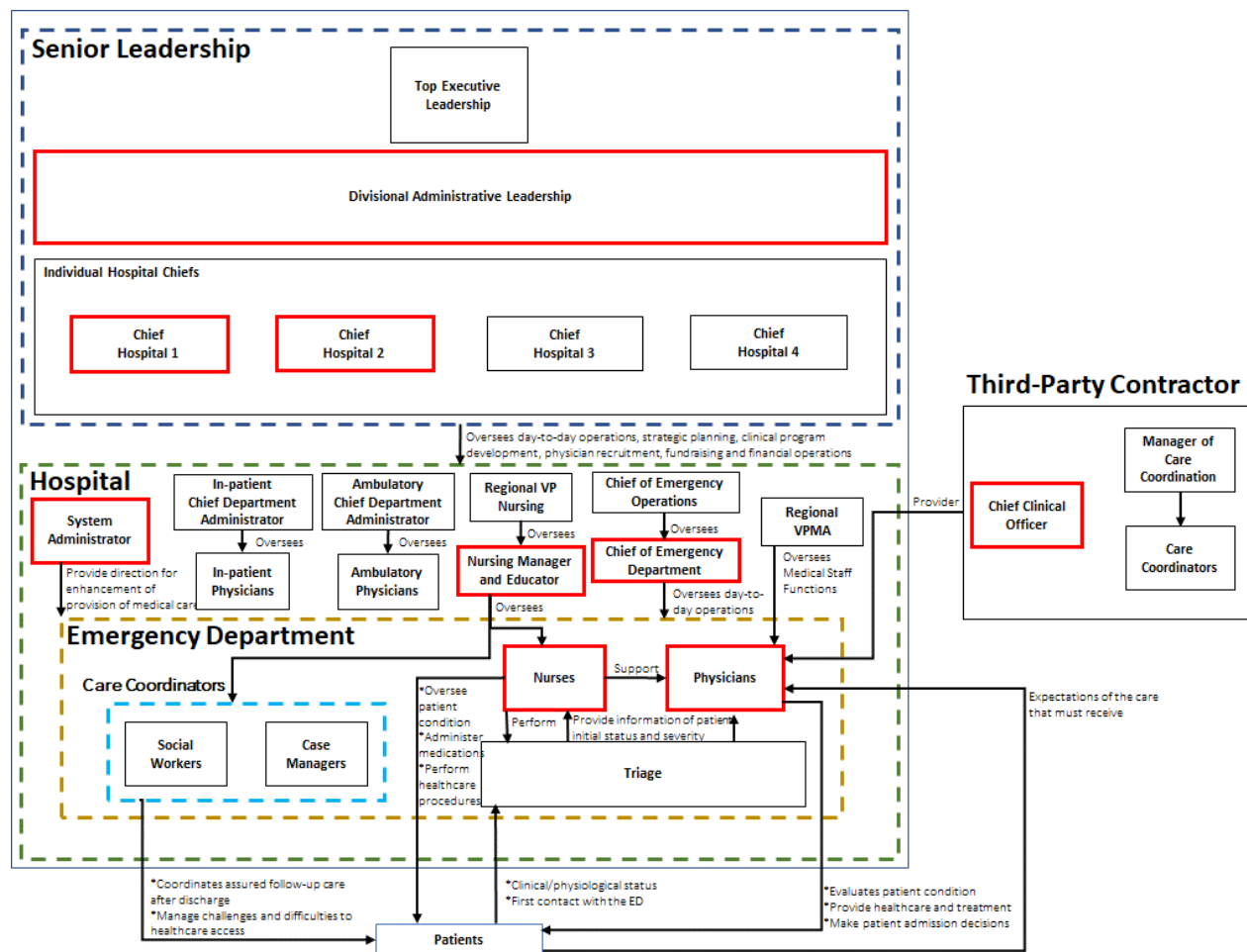
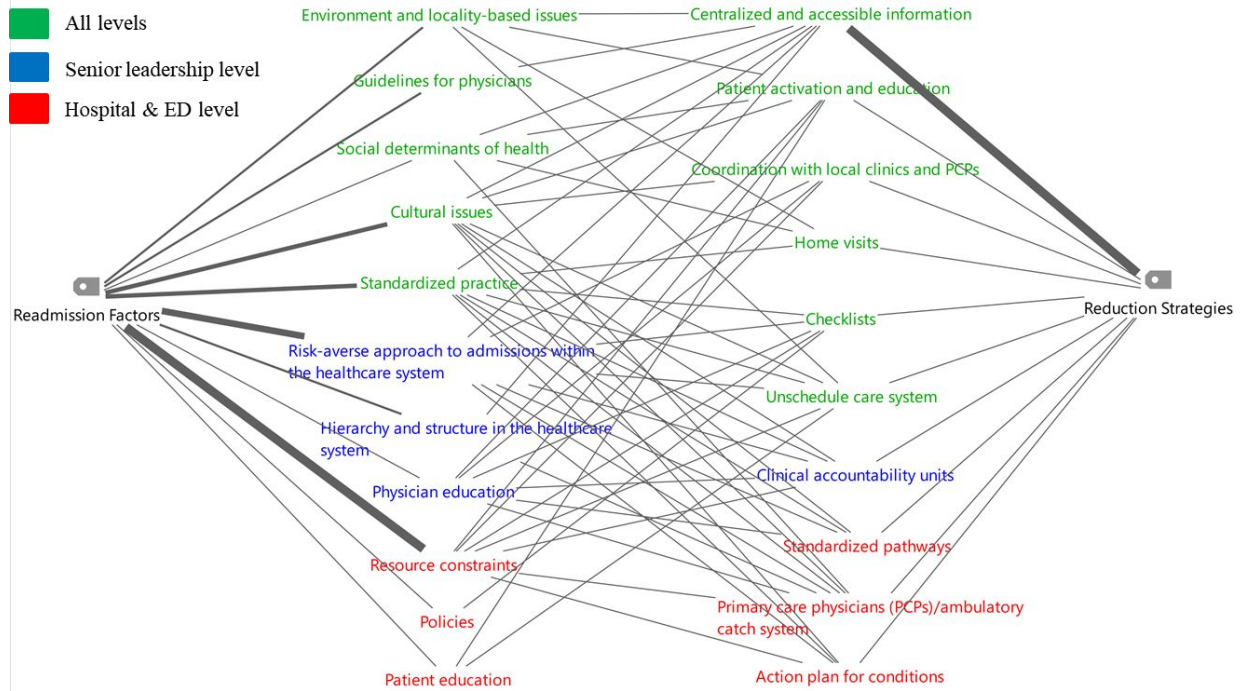


Figure 1. Healthcare system hierarchy



**Figure 2:** Mapping between the two thematic categories with sub-themes color-coded to represent their system-hierarchical levels

## Appendix A. Interview Guide

The goal of this research is to understand unnecessary readmissions.

1. Do you think you have this problem at [name of healthcare system]?
2. How would you define unnecessary admission? Can you give me specific examples?
3. What factors contribute to unnecessary admission at [name of healthcare system]?
4. We know anecdotally that there is a cultural push to be conservative when it comes to admitting— if that is true, why is it so?
5. What are the most common conditions that are admitted after presentation to the ED?
6. Are there any methods or tools you use to reduce unnecessary admission?
  - a. [probe] How would you assess the success of such methods?
  - b. [probe] If not, what methods do you think would provide benefits?
7. A literature review revealed that in-hospital management units are the most widely used

1  
2  
3 intervention in efforts to address ED visit reduction. How do in-hospital management units help  
4 address ED visit reduction at [name of healthcare system]?

- 5  
6  
7  
8 8. Collaboration and coordination with other clinical teams (e.g. PCP or local clinics) are less  
9 studied than other interventions to reduce ED admissions. Does [name of healthcare system]  
10 coordinate with PCP's and local clinics to reduce ED admissions? If so, how?  
11  
12  
13  
14 9. Patient education (both in the hospital and with home visits) and medication interventions have  
15 been proven to be effective in reducing hospital admissions. Does [name of healthcare system]  
16 use any patient education techniques? What about medication interventions?  
17  
18  
19  
20 10. Previous research indicates that the following patient demographics are correlated with ED  
21 admission within the [name of healthcare system] system: Medicaid, Medicare, Black, Hispanic,  
22 unmarried patients, as well as patients presenting with major disease severity and patients aged 34  
23 and above. Can you think of an explanation for these findings?  
24  
25  
26  
27  
28  
29 11. Is there anyone else you'd recommend talking to for this research?  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60