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## **An Analysis of the Concept of Patient Flow Management**

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### **Abstract**

**Aim:** To analyze the concept of patient flow management.

**Background:** Patient flow has a significant impact on the provision of patient care. The term “patient flow” is widely used, but the related concept of "patient flow management" has been poorly defined. The ability to differentiate and clarify the term patient flow management has implications on strategies to improve patient flow.

**Design:** Rodgers evolutionary method of concept analysis.

**Data Source:** Literature published between 2000 and 2021 in the PubMed, CINAHL, and Business Source databases.

**Review Methods:** Inductive analysis of the literature was performed to identify the usage and features of the concept.

**Results:** Patient flow management is defined as the application of holistic perspectives, dynamic data, and complex considerations of multiple priorities to enable timely, efficient, and high-quality patient care. Patient flow management requires the identification of a patient, care processes, a flow manager, and frontline staff. It has profound consequences on patient, staff, and hospital system outcomes.

**Conclusions:** Literature should more carefully delineate between “patient flow” and "patient flow management." Effective patient flow management increases the speed and quality of patient care, improves employee satisfaction, and reduces healthcare costs. Strategies to improve patient flow management should focus on understanding the role and interventions of flow management nurses.

**Keywords:** administration, concept analysis, management, role development

## Introduction

Emergency department (ED) crowding fundamentally threatens the delivery of safe patient care worldwide <sup>1</sup>. ED crowding is associated with delays in treatment, unnecessary patient suffering, adverse medical outcomes, increased healthcare costs, and reduced efficiency <sup>1</sup>. This crowding is a symptom of ineffective management of patient flow throughout the hospital system <sup>2</sup>. The issue is confounded by inconsistent use of terminology and by a poor understanding of how flow is managed. To address these problems, we performed a concept analysis of patient flow management.

## Background

In 2021, the International Federation of Emergency Medicine (IFEM) constructed a task force to study ED crowding <sup>1</sup>. They criticized the term “ED crowding” because it frames crowding as an ED, rather than a hospital-wide, issue <sup>1</sup>. The phrase “patient flow” has been suggested in place of “ED crowding” to help researchers address this severe public health problem <sup>3</sup>

Our concept analysis adds to this discussion by differentiating the concepts “patient flow” and patient flow management. “Patient flow” is defined as “the progressive movement of patients through care processes”<sup>4</sup>. This term was first used in operations research in the 1960s <sup>5</sup>. The related, but distinct, concept patient flow management was first described as *facilitation* of the movement of patients within a hospital system <sup>7</sup>. Definitions of patient flow management are scarce, creating a lack of clarity on its use and meaning <sup>8,9</sup>. The research on interventions to improve ED “patient flow” is vast <sup>4</sup>, however, only a small segment of this research focuses on patient flow management. The first step in developing effective strategies for patient flow management is comprehensively describing the concept.

### **Research Questions**

Two research questions are addressed:

1. What are the defining attributes of the concept patient flow management when used in the context of an inpatient hospital setting?
2. What are the contextual features of patient flow management, including its antecedents, consequences, surrogate terms, references, and related concepts?

### **Methods**

Concept analysis is a tool for synthesizing understanding of the attributes and boundaries of a concept <sup>10</sup>. This paper will use the evolutionary method developed by Rodgers, which emphasizes the context and dynamic nature of concepts, and relies on inductive analysis of a concept's usage in existing literature <sup>11</sup>. The primary activities of this method include identifying the concept, defining the setting and sample for data collection, identifying the attributes of the concept, and recognizing its contextual features, including the antecedents, consequences, surrogate terms, related concepts, and references. Researchers then describe an exemplar and consider the implications of the concept analysis, including future nursing theory and knowledge development <sup>11</sup>.

### ***Data Sources***

Data sources included literature published between 2000 and 2021 in PubMed, CINAHL, and Business Source databases. These parameters were established to include holistic nursing, medical, and business perspectives. Patient flow management is a concept applied in several patient care settings, such as urgent care centers, ICUs, or surgical wards. To capture the issue of ED crowding within an inpatient hospital setting, the keywords "flow management" and "emergency" were used along with the following criteria:

- Inclusion criteria: Literature written in English in the selected databases that discussed patient flow management in the ED and the wider inpatient hospital context.
- Exclusion criteria: Literature limited to specialty units or outpatient settings, and literature where the full text was not available.

The search methodology is summarized in the PRISMA flow diagram <sup>12</sup> in Figure 2.4. The initial search identified 113 articles, of which 25 were included as data. Because the term “flow management” is used by other disciplines, such as traffic control and water management, for clarity we use the phrase patient flow management.

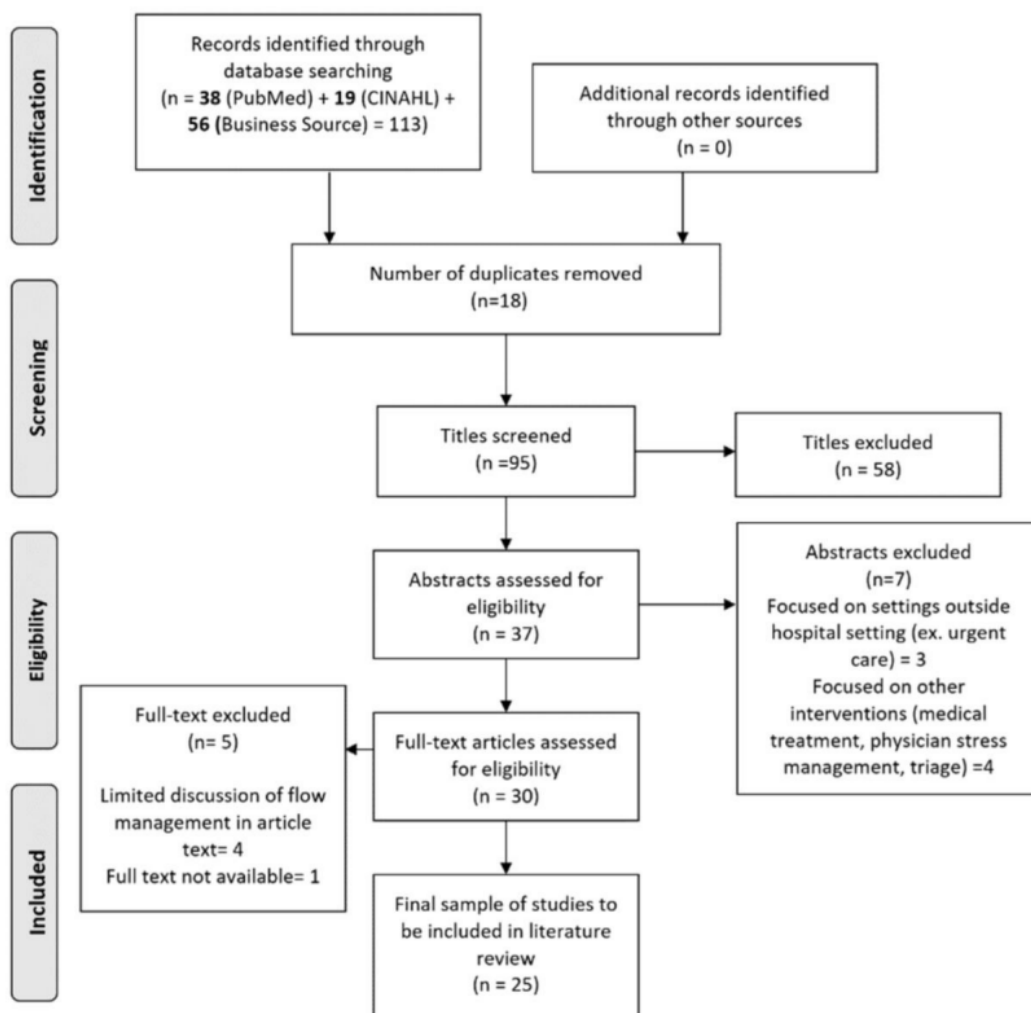


Figure 1. PRISMA diagram

### *Data Analysis*

Inductive analysis was conducted after reading the full text of the 25 articles. As Rodgers (2000) instructed, due to the infrequency of actual, provided definitions, consideration was made for any statements that described the usage or features of the concept. Primary attention was given to identifying major themes across the literature.

## **Results**

### *Defining Attributes*

Across the 25 articles reviewed, one explicit definition was found, stating “Flow management is constructed by multiple professionals through a series of intertwined activities and interactions that enable patient throughput”<sup>13</sup>. While this description reflects the complexity of patient flow management, the heart of the statement, “enable patient throughput,” merely substitutes one synonymous expression for another<sup>11</sup>. Other authors alluded to six defining attributes of patient flow management, which are decision-making that is 1) holistic, 2) dynamic, 3) complex 4) concerned with timeliness 5) concerned with efficiency, and 6) concerned with high-quality care. These attributes (see Table 2.1) are used to offer a new, richer definition of patient flow management that more clearly identifies the boundaries of the concept<sup>11</sup>.

**Table 1.** Concept attributes and supporting literature evidence

Attribute	Supporting Quotation
Holistic Perspectives	<p>“To ensure continuous care delivery, solving flow problems must not be limited to one unit, but should be extended to other departments – a prerequisite for solving flow problems in the entire hospital”<sup>14</sup></p> <p>“Maximizing patient flow must consider the entire system of care”<sup>8</sup></p>
Dynamic Data	<p>“To model patient flows and random patient arrivals (such as occurs in emergency departments), however, different methods are needed to incorporate the element of randomness”<sup>15</sup></p> <p>“Nurses’ perspectives suggest that inaccurate bed census data, delays in information seeking and processing leads to flow challenges”<sup>9</sup></p>
Complex Considerations	<p>“Hospitals around the world continue to struggle to manage patient flow effectively given the complexities of the normal admission, discharge, and transfer process— many processes must be completed in synchrony”<sup>16</sup></p> <p>“The movement of a patient depends on a complex sequence of processes that encompass communications, movements of equipment between departments, and coordination between staff and external organizations for delivering patient care”<sup>8</sup></p>
Concerned with Timeliness	<p>“Patient flow means providing patient care in the most clinically appropriate, timely and cost-effective way possible”<sup>17</sup></p> <p>“We want to emphasize that studying inpatient flow dynamics at hourly resolution and capturing time-of-day performance are important, especially when one evaluates policies that impact the interface between the ED and wards, where hours of waiting matter”<sup>18</sup></p>
Concerned with Efficiency	<p>“In hospitals, several patient flows compete for access to shared resources”<sup>14</sup></p> <p>“The main function of this [logistics management] team is efficient placement of a patient”<sup>19</sup></p>
Concerned with High-Quality Care	<p>“Streamlining patient flow can provide a better use of available hospital resources by reducing waste (e.g., idling bed), and thereby treat more patients without sacrificing quality of care”<sup>8</sup></p> <p>“Decreasing wait times and crowding in the ED increases quality of care and improves patient health outcomes”<sup>20</sup></p>

**1. Holistic Perspectives.**

Patient flow management requires a holistic, system-wide perspective. Just as ED crowding is recognized as a problem arising from the entire health system<sup>21</sup>, management of patient flow



must include all aspects of a patient care journey<sup>8, 14, 20</sup>. Flow managers consider system-wide staffing, capacity, and resources in order to avoid resource mismatching and inefficiencies<sup>8, 16</sup>.

The implementation of patient flow management interventions requires multi-disciplinary support and collaboration between employees across a hospital<sup>8, 16, 22</sup>. Organizational culture and teamwork have a significant impact on success<sup>13, 16</sup>. These holistic strategies can improve patient flow metrics such as ED and inpatient length of stay<sup>16, 19</sup>.

## **2. Dynamic Data.**

Patient flow management is based on dynamic data of variable quality. Variability in the rate of patient arrivals, including ED arrivals, admissions, and scheduling of elective surgeries, is the most prominent factor impacting patient flow<sup>14</sup>. Rates of daily patient admissions, discharges, and transfers are challenging to predict<sup>15</sup>. Flow managers must accommodate rapid, fluctuating changes in patient volumes<sup>23</sup>. Dynamic decision-making might involve opening extra nursing units, adjusting the operating room schedule, discharging patients<sup>14</sup>, or transferring patients to different units in response to the variable patient census<sup>15</sup>.

Flow managers contend with inaccurate patient flow data, including incorrect bed availability and patient census numbers<sup>9, 19</sup>. Real-time data processing is essential for patient flow management to ensure that their information is accurate and up-to-date<sup>13, 16, 24, 25</sup>.

## **3. Complex Considerations.**

Patient flow management is a complex process<sup>8, 9, 16, 26</sup>. This complexity is created by a multitude of actors, simultaneous processes, and considerations. The complexity requires flow managers to have specific training and a wide range of flow management strategies<sup>9, 19, 27, 28</sup>.

First, complexity arises from the need for coordination between many professionals<sup>8, 29</sup> across multiple settings<sup>15</sup>. These include medical providers, nurses, bed managers, case

managers, environmental managers, patient transporters, transfer coordinators, and pre-hospital providers <sup>9</sup>.

Second, complexity results from the need for management of multiple simultaneous processes for patients at different stages of care <sup>29</sup>. Flow managers must consider admission, transfer, and discharge processes <sup>16</sup>. Several flow processes occurring at the same time, such as the separation of adult and pediatric patients in the ED, adds further complexity <sup>30</sup>.

Third, complexity is created by the need to consider several, often conflicting, priorities and stakeholders <sup>31</sup>. Flow managers must contend with barriers to patient flow stemming from power imbalances between providers, including disagreements about the necessity of consults or admission to specialist teams <sup>13</sup>. The workload and stress levels of nurses and providers must also be considered <sup>26, 32</sup>. The decision to assign a patient to a particular bed might be influenced by the acuity of patients in a nurse's assignment, the skill set of that nurse, or the time since his/her last patient arrival <sup>26</sup>. Staffing, administrative, and resource considerations must be balanced with considerations of patient acuity, severity, and complexity <sup>26</sup>.

Finally, external pressures such as national benchmarks, financial concerns, and target wait times affect the patient flow management process <sup>13, 20</sup>. Flow managers are held responsible for increasing the speed of patient flow and maximizing efficiency <sup>13</sup>.

#### **4. Concerned with Timeliness.**

Successful patient flow management is timely <sup>13, 17, 18</sup>. Rapid patient treatment and measurement and enforcement of time-based targets are critically important. Patient flow management that minimizes ED wait times is crucial for timely life-saving interventions for the most critical patients and increases the number of patients providers can treat <sup>33</sup>. Inpatient admission wait times also affect patient outcomes and are a focus of patient flow managers <sup>18</sup>.

Flow managers face the pressures of meeting external benchmarks for wait times<sup>13</sup>. Hospital administrators track and measure the rate of patient flow<sup>8</sup>. Patient flow management effectiveness is described in terms of delays and blockages<sup>8, 14, 16, 21</sup>. When delays are encountered, flow managers rely on rapid communication, problem-solving, and negotiating with providers to increase the rate<sup>13</sup>.

### **5. Concerned with Efficiency.**

Patient flow management occurs within the context of restricted resources. Decision-making is limited by number of beds, physical space, staffing, and equipment<sup>14, 26</sup>. Therefore, patient flow management is a process of matching supply and demand<sup>14, 16</sup>, including rationing, prioritization, and concern with efficiency<sup>19, 32, 34</sup>.

### **6. Concerned with High-Quality Care.**

The final goal of patient flow management is high-quality patient care<sup>17, 23, 26</sup>. This was defined by care that is clinically appropriate, safe, and that improves the patient experience<sup>16</sup> and satisfaction<sup>17, 20</sup>. Patient flow management, most notably its impact on wait times, significantly shapes patients' perceptions of care regardless of the clinical care quality<sup>33</sup>. Patient flow management requires consideration of patient clinical needs<sup>8</sup>, severity<sup>15, 19</sup>, nursing workload, and staff skill level<sup>26</sup> to maximize patient safety.

### **Summary of Defining Attributes**

Using the six essential attributes, a new definition of patient flow management is proposed: Patient flow management is the application of holistic perspectives, dynamic data, and complex considerations of multiple priorities to enable timely, efficient, and high-quality patient care. Reflecting on the nominal definition<sup>11</sup> to "enable patient throughput,"<sup>13</sup> this new definition clarifies both *how* and *why* patient flow management endeavors to improve patient flow.

### *Antecedents*

After identifying the essential attributes of a concept, the temporal context is examined<sup>11</sup>. Antecedents are conditions that must be present *before* the manifestation of a concept. In the context of an acute care hospital system, there are four antecedents to patient flow management: a patient, care processes, the flow manager, and frontline staff.

While usage of the concept patient flow management is applied most often in the context of multiple patient pathways<sup>13, 17</sup>, patient flow management decisions have also been described in terms of individual patients<sup>31</sup> or “patient-by-patient”<sup>17</sup>. Therefore, the first antecedent is simply the identification of a patient.

The second antecedent is a set of care processes. Patients are moved through these care processes, which are defined by the scope of the care setting. Some authors were found to focus only on the ED<sup>27, 28, 33</sup>, while others also describe the inpatient setting<sup>8, 22</sup>. Care processes include ambulance transport<sup>25, 35</sup> arrival to the ED<sup>26, 28</sup>, triage, allocation to an ED bed, ED treatment, diagnosis, hospital admission<sup>26</sup>, inpatient bed assignment, transport from the ED to the inpatient unit<sup>8</sup>, inpatient therapy<sup>31</sup>, external transfer, and discharge<sup>8</sup>.

Third, patient flow management requires a flow manager. Actors in this role include nurse managers, medical directors, directors of clinical operations, hospital executives<sup>22</sup>, transfer operators, admission coordinators, case management supervisors, internal/external transport coordinators<sup>8</sup>, flow coordinators, bed managers, nurse navigators, clinical site supervisors, and discharge nurse navigators<sup>9</sup>. Patient flow management teams might also incorporate ED leadership, or leadership from environmental services and patient transport departments<sup>16</sup>. Providers also play an integral role by managing patient trajectories with diagnosis, admission,

and discharge decisions<sup>26, 27, 32</sup>. These roles perform patient flow critical-thinking and strategizing that differentiates them from frontline staff.

The final antecedent is frontline staff who treat, perform diagnostic tests, and facilitate the physical movement of patients. These staff members include nurses, transporters, and environmental workers<sup>8</sup>, ambulance workers<sup>29</sup>, phlebotomists<sup>13</sup>, x-ray and laboratory staff, specialty consults, and registration clerks<sup>32</sup>. Flow managers must coordinate with the frontline staff who complete the tasks necessary to advance patients through their care processes.

### ***Consequences***

The second element of the temporal context is a concept's consequences<sup>11</sup>. Patient flow management has broad consequences on patient, staff, and system outcomes.

Consequences on patient outcomes include both the speed and quality of care. Frequently cited metrics include ED and inpatient length of stay<sup>17, 19, 20, 22</sup> and wait times, including the time to initial provider evaluation<sup>23, 30, 31</sup>. Patient flow management also influences left without being seen rates (LWBS)<sup>17, 20, 22</sup>, patient satisfaction, and patient safety<sup>16, 17</sup>. Small changes in ED wait times impact patient outcomes<sup>28</sup>, and prolonged waits for transfers to the ICU are associated with higher patient mortality<sup>15, 34</sup>.

Consequences of patient flow management also include staff and system outcomes, including staff stress levels, employee satisfaction<sup>16, 17</sup>, healthcare costs<sup>8, 14, 31</sup>, and utilization of medical resources<sup>31</sup>. As Lovett, Illg and Sweeney (2016) succinctly explains, "A performance improvement initiative focused on improving patient flow [has] the potential to impact every aspect of the operation" (p. 247).

### ***Surrogate Terms and Related Concepts***

Surrogate terms are words or phrases that are used interchangeably with a concept, while related concepts are connected ideas that have distinct attributes and definitions<sup>11</sup>. Surrogate phrases identified include “flow coordination” and “improving patient flow.” While not explicitly defined, “flow coordination” denotes the desire to manage patient flow and was used when describing a team similar to a patient flow management team<sup>22</sup>. The phrase “improving patient flow” was defined as the optimization of resources along the patient journey<sup>16</sup>, and has been used interchangeably with patient flow management<sup>14</sup>. Several authors were found to use the phrase “patient flow” instead of patient flow management<sup>17, 26, 31</sup>. This usage incorrectly equates the *movement* of patients with the *action* of directing this movement. “Patient flow” is a related concept but should not be used as a surrogate term.

Other related concepts include “ED throughput,” defined as the quantity of patients treated per hour<sup>27</sup>, and “ED crowding,” when patient arrivals exceed discharges and transfers out of the department<sup>26</sup>. “Patient logistics” and “patient flow logistics” also describe the movement of patients but do not encompass the management and critical thinking of patient flow management<sup>23, 31</sup>.

### ***Interdisciplinary/Sociocultural Context and References***

The contextual basis of a concept is the conditions in which it is used and how it is used by different people<sup>11</sup>. References are defined as real-life situations in which the concept is applied<sup>11</sup>. Patient flow management is an interdisciplinary concept. We found that it was discussed in business, medicine, and nursing journals. Among the articles included in this analysis, 13 discussed the impacts of a specific patient flow intervention. Other studies utilized qualitative data to identify patient flow management barriers and strategies<sup>8, 13, 14, 26, 27</sup>. Two

studies retrospectively evaluated the impact of flow decisions on patient outcomes<sup>34</sup> or metrics such as ED wait times<sup>30</sup>.

To summarize, the concept of patient flow management was applied when examining the impact of a specific intervention on patient flow, when identifying barriers or strategies to improve patient flow, or when studying the impact of flow decisions on patient care. Patient flow management is a concept that is described by several disciplines and used across hospital departments.

### ***Exemplar***

Exemplars can help clarify and define a concept<sup>11</sup>. It may be appropriate to review additional literature to identify an exemplar when concepts are in early stages of development<sup>11</sup>. Patient flow management is exemplified by bed coordinators, who determine patient bed assignments<sup>8, 9, 13, 16, 17</sup>. One element of this decision is whether to assign a patient to a single- or multiple-occupancy room<sup>36</sup>.

The act of determining room occupancy meets the four antecedents of patient flow management. Bed coordinators act as *patient flow managers* who perform the critical thinking of this decision<sup>36</sup>. They depend on *frontline staff* who provide the cleaning, transport, and paperwork required to move patients to new rooms<sup>36</sup>. The need to determine room occupancy arises from the progression of *patients* through *care processes*, including the admission of ED patients to an inpatient floor and the provision of inpatient therapy that advances patients toward discharge.

Determining whether a patient is assigned to a single room requires careful consideration of the individual patient's needs when balanced with competing patient needs and overall hospital capacity (*holistic perspectives*)<sup>36</sup>. Bed coordinators weigh many factors including

patient behavior, whether the patient has a communicable disease, patient insurance, the specialty equipment inside each room, and family preferences (*complex considerations*)<sup>36</sup>. These considerations are in constant flux due to unpredictable ED admissions and changing patient needs (*dynamic data*). For example, patients may suddenly require a private room when they become dangerous, disruptive, infectious, or when they near death<sup>36</sup>. In these situations, rapid room adjustments are needed for patient and staff safety, or to accommodate family visitation before a patient passes away (*concerned with timeliness*)<sup>36</sup>. In fact, bed coordinators reported that the safety concerns of infection control and violent behavior were the most compelling reasons to place patients in single-occupancy rooms (*concerned with high-quality care*)<sup>36</sup>. While facing these fluctuating needs and weighing the interests of multiple patients waiting for an available single-occupancy room, bed coordinators endeavor to achieve the optimal bed assignment to prevent wasting resources needed to make room change adjustments (*concerned with efficiency*)<sup>36</sup>.

Room occupancy decisions have consequences on patients, staff, and the hospital system. Patients in single-occupancy rooms perceive greater privacy and dignity but may also suffer from loneliness and increased anxiety<sup>36</sup>. Nurses report that having a private room shapes the care they can provide, providers want their patients' room assignments closer to their offices, and environmental workers' workload is increased by frequent bed assignment changes<sup>36</sup>. The ability of bed coordinators to match patients efficiently to the right room impacts hospital capacity, and the placement of a patient with private insurance in a single-occupancy room increases hospital revenue<sup>36</sup>. Thus, although establishing room occupancy is just one consideration in a plethora of bed coordinator decisions, it highlights the features of patient flow management.



### **Implications and Discussion**

One of the most important outcomes of a concept analysis is the identification of future areas for research <sup>11</sup>. One critical topic for inquiry is the role of patient flow management nurses. Nurses conduct patient flow management in roles including flow nurses, navigator nurses, site managers, bed management nurses, and discharge planners <sup>9</sup>. While their impact is significant, nursing contributions to patient flow were only recently systemically reviewed <sup>9</sup>. Additional research is needed to capture their potential <sup>9</sup>.

Patient flow management strategies is another area for exploration. We found little delineation between the terms “patient flow management” and “improving patient flow.” This suggests that there is poor distinction between hospital-wide, administrative interventions such as building extra beds or hiring more staff <sup>14</sup>, and the day-to-day strategizing of patient flow management nurses and teams. Inpatient flow management research has focused on interventions that require additional resources, with little focus on how to optimize existing capacity <sup>14</sup>. Research on the critical-thinking and problem-solving of patient flow management nurses could be an opportunity to identify more cost-effective and feasible strategies <sup>9</sup>. Future inquiry could focus on examining patient flow management as a nursing intervention, as opposed to executive decision-making.

Finally, concepts analyzed through the evolutionary method are not viewed as static or definitive <sup>11</sup>. Instead, concept analyses aim to provide the clarity necessary for future research and concept development <sup>11</sup>. There are many other considerations that were not found in this inductive analysis of literature, but that warrant further investigation to clarify our understanding of patient flow management.

### **Conclusion**

Through the process of concept analysis, we have clarified the concept of patient flow management by identifying the defining attributes, including decision-making that is holistic, dynamic, complex, concerned with timeliness, concerned with efficiency, and concerned with high-quality care. Patient flow management requires the identification of a patient, care processes, a flow manager, and frontline staff. Patient flow management has extensive consequences on patient, system, and staff outcomes. It is a concept that is shaped by the work of multiple disciplines and is applied across the hospital system. As the exemplar illustrated, knowledge and application of patient flow management principles can significantly impact the provision of care. Future research should continue to expand the understanding of patient flow management with a focus on the role and strategies of flow management nurses.

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