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Solution

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How Hospitals Can Improve Care Processes with Patient Flow Systems

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Global eHealth Executive Council

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Abstract

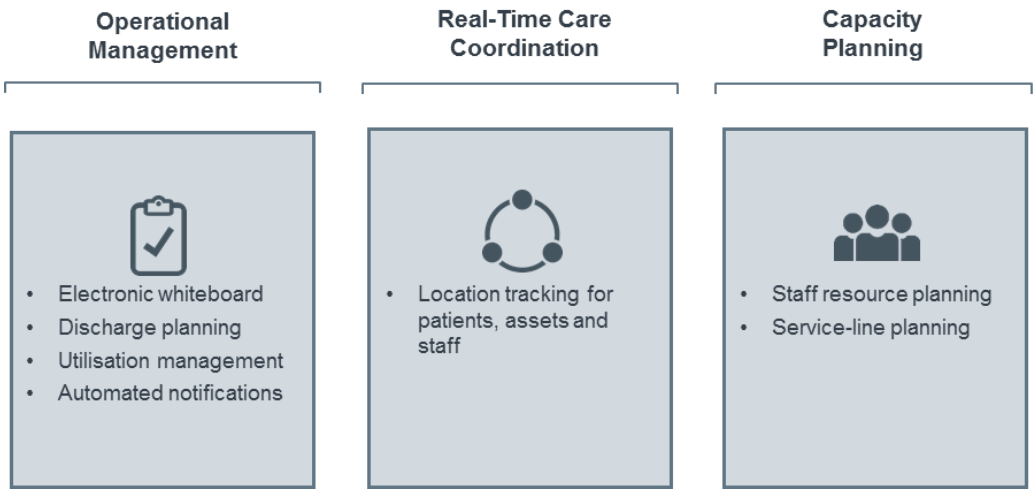
Patient flow systems can help hospital organisations reduce average length of stay (LOS) by identifying bottlenecks that create delays in care and helping clinicians plan for patients' discharge from the time of admission. Improving care processes in this way helps save clinicians' time and enables hospitals to see more patients. Moreover, in some countries, hospital organisations incur penalties such as reduced reimbursement when LOS exceeds defined limits. Patient flow systems can provide a single view of ward activity, map activity across the hospital organisation and guide decisions about staff mix and facilities requirements. However, patient flow systems can help only if the hospital organisation has high-quality data and a strong, data-driven culture. Clinical and administrative leaders should be prepared to accept the insights patient flow systems reveal, even when they may challenge popular thinking and require changing existing work practices.

Defining Patient Flow Systems

Patient flow systems can provide a holistic, real-time view of hospital activity that helps save time and reduce LOS and costs by coordinating necessary staff and equipment to best meet patients' needs. Patient flow systems, when combined with other data sources, can also help hospital leaders identify the root cause of issues such as excessive emergency department (ED) waiting times, procedure cancellations and delayed discharges.

Confusion exists about what constitutes a patient flow system. This is because vendors use the term "patient flow" to mean multiple things such as automating bed management, providing a holistic view of hospital activity and supporting capacity planning. We define three categories of patient flow systems, depending on the function they perform, in Figure 1 below.

Figure 1: Patient Flow Planning Tools



Operational Management

Operational management systems present a live view of hospital activity and typically replace the physical whiteboards traditionally used in hospital wards with electronic whiteboards, often using touchscreens. They display essential information for clinicians,

including bed availability, special requirements (e.g., dietary restrictions) and the availability of lab test results.

Electronic whiteboards, which are also referred to as bed management systems, can also monitor the LOS for admitted patients and flag patients nearing their expected discharge date, helping with discharge planning. This helps clinicians prioritise patients who are at risk of exceeding their expected LOS. Data may initially be populated from administrative systems, based on the maximum LOS accepted by payers for a given condition. However, clinicians can adjust the LOS manually to reflect a patient's individual circumstances. When patients are ready for discharge, the systems can be configured to notify staff, such as the social care team. When patient discharges are delayed, clinicians can use the system to record the reasons for these delays, such as awaiting sign-off for prescription medications for the patient to take home, or the unavailability of social service resources.

Building on this, some vendors offer utilisation management. This gives hospitals a more refined view of patient health, enabling them to identify potential problems at an earlier stage. Under this approach, admitted patients are assessed daily against defined sets of clinical indicators to confirm they are receiving an appropriate intensity of care in the most suitable care setting. Patients are flagged if the criteria indicate they should be treated with a higher or lower intensity of care than they are currently receiving. For example, patient flow systems supporting utilisation management could identify patients currently treated in hospital who could be treated at home. Medworxx is one vendor that specialises in this area, offering evidence-based criteria sets that are designed to assess any admitted patient.

Efficiency can be further improved with automated notifications. For example, environmental services staff could receive an electronic request to change linens in a given room. A cleaner could then confirm completion using a mobile app and proceed to the next request without having to contact a central dispatch centre. Automated processes can also support care coordination by notifying staff and external providers to prepare for the next phase of care. For example, social services organisations can be notified before a patient's discharge so they can make needed adjustments in a patient's home, or ensure that the patient's family has arranged transportation.

Solutions for improving operational management are included as a basic function of integrated electronic medical record (EMR) systems. However, these may not be designed in a way that meets clinicians' needs. For example, they may require users to work through several menus to complete basic tasks such as assigning a patient to a bed. Hospitals can also procure stand-alone solutions such as those offered by Allocate Software, Cayder, or Imatis AS. Further information on vendors and products can be found in Table 1 at the end of this report.

Real-Time Care Coordination

The true power of patient flow systems comes when activity can be mapped across the hospital as a whole rather than in individual wards or departments. Systems such as TeleTracking and GE Agiletrac use real-time location system (RTLS) technologies to track equipment, patients and staff. This helps identify causes of delayed discharges and provides evidence that can be used to develop more efficient processes. For example, nurses may be spending too much time looking for medical equipment, a situation which could be addressed by improving how the equipment is stored and managed.

RTLS technologies can also help clinicians and staff better plan their daily work. For example, doctors making rounds can be notified that a patient is undergoing dialysis in another part of the hospital, thereby avoiding a wasted visit. More information on the challenges and benefits of applying location technologies can be found in the Global

eHealth Executive Council study "Mobility in Action: Location-Enabled Communications and Business Process Management".[1]

Capacity Planning

Systems that support capacity planning can help hospital organisations plan staffing levels and facility requirements. Capacity planning can be used not only over the long term (e.g., annual planning), but also over the shorter term (e.g., a week or a few days out) to roster staff in line with expected levels of patient demand. For example, historic data on patient volumes in a particular ward can be used to predict optimum staffing levels for a future day or shift. Analysis from the capacity planning system can then be linked to e-rostering systems to support decisions on shift allocation.

These systems can also help hospital organisations make difficult decisions such as changing the range of services offered. For example, a hospital organisation planning to stop treating patients with specific conditions can use 'what-if' scenarios to predict the likely effects on other clinical services.

RTLS and capacity planning solutions build on the core functionality provided by operational management systems.

Potential Benefits

Improving patient flow for admitted patients helps improve patient care throughout the hospital organisation.

Improved Care Quality for Patients Presenting in the Emergency Department

The Advisory Board Company research indicates that improving patient flow processes for admitted patients can help contribute to reducing waiting times in hospital EDs. Patients ready for discharge are occupying beds that could be utilised by patients in the ED who are waiting for admission. Resolving this problem helps free up ED resources to treat other patients, reduce ED waiting times and improve overall care quality.[2] For example, one study of six hospitals in Perth, Australia, found that EDs reducing congestion saw patient volumes increase by 10% and mortality rates decrease by 13%.[3]

More Time for Clinicians to See Patients

Patient flow systems enable clinicians, and nurses in particular, to carry out common tasks, such as requesting a bed, requesting a porter or handing patients' care over to clinicians covering the next shift. This frees up time that would have been spent making phone calls to colleagues in other departments. Effective use of the system can give clinicians more time to spend with their patients and follow best practices, such as making daily assessments of patients' progress toward discharge.

1) Kleinberg, Ken, "Mobility in Action: Location-Enabled Communications and Business Process Management", 28 June 2013, http://www.advisory.com/International/Research/Global-eHealth-Executive-Council/Studies/2013/Mobility-in-Action.

2) Members of the Clinical Operations Board can find more information in the study "The Clockwork Emergency Department: Strategies for Optimising Efficiency in the Emergency Department", http://www.advisory.com/International/Research/Clinical-Operations-Board/Events/Webconferences/2013/Clockwork-ED.

3) Geelhoed, Gary C, and Nicholas H de Klerg. "Emergency department overcrowding, mortality and the 4-hour rule in Western Australia." *The Medical Journal of Australia*. 196, no. 2 (August 2012): 122-126. This study can be accessed on the following link: https://www.mja.com.au/journal/2012/196/2/emergency-department-overcrowding-mortality-and-4-hour-rule-western-australia.

Better Management of Contagious Patients in the Hospital

Patient flow systems supporting operational management can help identify patients or staff who came in contact with a patient who had a contagious infection. This helps prevent the spread of infections in hospital settings. Patient flow systems also provide bed maps that can help clinicians identify available isolation rooms so patients can be moved earlier.

Shorter Lengths of Stay

Delays caused by clinicians, porters or equipment not being at the right place at the right time add up across a patient's hospital stay. Patient flow systems supporting operational management and real-time care coordination can help hospitals deliver more co-ordinated care that minimises these delays and enables patients to be discharged earlier than they otherwise would. This potentially enables hospitals to see more patients and reduce waiting times. However, although technology can play a role, reducing LOS is likely to require some changes in processes and culture, which may be difficult.[4]

Improved Capacity Planning and Staff Rostering

Capacity planning solutions apply historic activity to help executives predict future requirements and make more informed strategic choices. For example, hospitals can assess the impact of closing a ward or the benefits of increasing capacity. Staff can also be rostered more efficiently by predicting periods of greater or reduced demand. The power of capacity planning solutions will increase over time as hospitals capture more data and create more robust predictive models.

Improved Design of Hospital Facilities

Capacity planning solutions can enable hospital leaders to design more efficient layouts of hospital facilities. The rich data generated by RTLS technologies can support process improvement methodologies such as Lean and identify areas of inefficiency. Alternative designs can then be modelled and tested to measure benefits such as reduced time spent walking from one point to another, or improved access to medical equipment.

Considerations

Hospital leaders should consider the following when planning for a patient flow system:

Existing System Capabilities

In some cases, hospital leaders may find that their organisations already have patient flow functionalities in existing systems that are not being used to their full potential. For example, a patient administration system (PAS) may include bed management functionality that cannot be used effectively because the PAS is not being updated in real time. If the PAS were updated in real time, there may not be a need for a separate patient flow system.

4) Members of the Clinical Operations Board can find more information on how hospital organisations can reduce LOS in the following webconference: "Clockwork Efficiency (UK Edition): Mastering Complex Discharge to Manage Capacity". http://www.advisory.com/International/Research/Clinical-Operations-Board/Events/Webconferences/2013/Clockwork-Efficiency-UK-Edition.

Data Quality

Patient flow systems depend on accurate and complete data, which often need to come from existing clinical and administrative systems. Clinicians need confidence in the data if they are to act on it. Integrated EMRs, combined with strong data governance, provide the best infrastructure, as all patient information is captured and managed through a single database. Hospitals taking a best-of-breed approach for clinical systems may find it more difficult—and potentially more risky—to implement patient flow systems due to the possibility of missing essential information. This is because, in a best-of-breed environment, the patient flow system would need to interface with several other clinical and administrative systems to obtain data; changes to any of these systems could cause problems with essential interfaces. The risk increases with the number of systems involved. If hospitals do not have interfaces with other clinical systems, clinicians may need to enter information directly into the patient flow system. This is time consuming and also could increase the risk of data discrepancies.

Choosing the Optimal RTLS Technologies

IT leaders should also ensure that the most appropriate RTLS technologies are chosen for the assets or individuals being tracked. The choices made will shape the level and quality of information that can be populated into a patient flow system. Considerations will include existing network capacity, affordability, the level of accuracy needed (e.g., room level versus centimetres), the environment (e.g., high noise levels) and the layout of hospital facilities. For example, using RTLS to detect patient falls will require a different technology than a solution used to detect which room an infusion pump might be in. Hospital organisations can apply a mix of network technologies, such as radiofrequency ID (RFID) and Wi-Fi, to meet their local needs. More information about the options available with RTLS technologies can be found in the report "Real-Time Location Systems for Health Care".[5]

Cultural Readiness

As hospital leaders receive insights from patient flow systems, they should be prepared to address the problems identified. Patient flow systems may expose workarounds that rely on inaccurate reporting of data. For example, analysis may find that some beds are empty at a given point in time but are classified as occupied. This could be a result of clinicians intentionally classifying beds as occupied to reduce the number of patients entering a ward and give themselves more time to treat patients already there. Hospital leaders can use the Advisory Board's BI Maturity Model to assess their readiness and should aim to have an "Advanced Analytics" or "Big Data" level of cultural maturity. Further information on the BI Maturity Model can be found in the on-demand webconference "Applied Business Intelligence".[6]

Costs and Implementation

Costs for a patient flow system supporting operational management can vary from $30,000 (US) for a single ward to more than $1.5M in a multi-site organisation. Hardware costs contribute a significant portion of costs, with each digital touch screen costing around $5,000. Where mobile apps replace the use of phones, IT leaders would

5) Kleinberg, Ken, and Kate Goddard, "Real-Time Location Services for Health Care." 26 June 2013, http://www.advisory.com/International/Research/Global-eHealth-Executive-Council/Research-Notes/2013/Real-Time-Location-Systems-For-Health-Care.

6) Aranow, Meg, "Applied Business Intelligence," http://www.advisory.com/International/Research/Global-eHealth-Executive-Council/Events/Webconferences/2013/Applied-Business-Intelligence.

also need to consider the costs of smartphones. Adding the RTLS technology used by systems providing real-time care coordination can cost between $750 and $1,500 per bed, or between $600,000 and $1.2M for an 800-bed hospital, assuming the network is already capable. Vendors estimate that it can take between 4 and 12 months to implement a patient flow system, depending on the functionality used and the size of the implementation.

Achieving return on investment from patient flow systems will depend on how well organisations address the issues raised in this report. It will also depend on how care is compensated. Where hospitals are paid per procedure, for example, reduced LOS will help increase patient throughput and therefore can help generate additional revenues. If the hospital is being paid through general budgets or capitation, patient flow systems can help improve clinical quality and patient satisfaction while lowering costs.

Representative Patient Flow Vendors

Hospitals have a choice of several vendors for patient flow systems, including those shown in Table 1 below. Vendors are categorised based on information they have provided. Note that many vendors appear in more than one category.

Table 1: Representative Vendors

	Vendor	Product
Operational Management	Allocate Software	Real Time Health
	Allscripts	Allscripts Patient Flow
	Care Logistics	Patient Logistics
	Cayder	Cayder Patient Flow Manager
	Cerner	CareAware
	Central Logic	Central Logic Core (multiple products)
	Epic	Epic EMR
	GE Healthcare	Agiletrac
	Health IQ	Patient Flow Manager
	Imatis AS	Multiple products
	Intelligent Insights	Intelligent Insights
	Medworxx	Medworxx Patient Flow
	McKesson	McKesson Performance Visibility
	TeleTracking	Multiple products
Real-Time Care Coordination	Cerner	CareAware
	Epic	Epic EMR
	GE Healthcare	Agiletrac
	Intelligent Insights	Intelligent Insights
	McKesson	McKesson Performance Visibility
	TeleTracking	Multiple products
Capacity Planning	Cerner	CareAware

	Vendor	Product
	Epic	Epic EMR
	GE Healthcare	Patient Care Capacity Management
	Health IQ	Patient Flow Manager
	McKesson	McKesson Capacity Planner
	ProModel	MedModel
	TeleTracking	Multiple products

Action Items

- **When planning for a patient flow system, ensure that your existing systems can provide the data required.** Patient flow systems largely rely on data populated by existing clinical and administrative systems. If existing systems cannot provide the data required, the value of the patient flow system will be reduced.
- **Consider the functionality of your existing systems before procuring a patient flow system.** Many hospital organisations may have existing systems that can provide some aspects of patient flow functionality. For example, hospital organisations using a PAS or an integrated EMR may already support operational management.
- **Involve clinicians and hospital staff from the outset.** The success—or failure—of a patient flow system hinges on the support of those using it. Involving clinicians and staff when selecting, designing and implementing a patient flow system increases their support for the system and their likelihood of using it as intended.
- **Collaborate with hospital leaders to improve the quality of data.** Patient flow systems can challenge existing practices. Clinicians and hospital leaders need to trust the data before they can accept the conclusions drawn from it and change working practices. To improve data quality, hospital organisations need to set up a data governance committee that represents departments across the organisation. This committee would establish common definitions for data, such as LOS, and establish best practices for working with data. IT leaders can then work with each department to identify those responsible for entering data, and, where appropriate, provide training and support so that data meets agreed-upon standards of quality.