Hospital of the Future

Critical steps to improve clinical outcomes, cut costs, improve safety and meet the challenges of the future today.

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Executive Summary

This paper explores two main questions on the minds of hospital executives today. What will the hospital of the future look like? And, how must my hospital adapt in order to not just survive, but to thrive? You're no stranger to the trends that are disrupting the healthcare industry. While change has always been a given in healthcare, the number and ferocity of disruptive drivers today aren't just evolving health care, they are revolutionizing it.

Among these is the emergence of the patient-centered care paradigm. This shift is aggressively reshaping the manner in which care is delivered. Its precepts are driving how hospitals are paid/reimbursed. Other powerful drivers include an aging population and a higher acuity patient population. At the operational level, executives are grappling with challenges related to labor shortages, the pressing need to contain costs and find ways to leverage "big data" to improve care delivery.

We believe that the successful hospital of the future is one that efficiently delivers quality care and consistently improves clinical outcomes. And it will do this while providing a positive patient experience. Moreover, the model hospital of the future will adopt workflows, policies, systems and solutions that optimize operational efficiencies. Integrating these disparate systems, it will leverage software applications to enable the collection, management and analysis of patient and operational data. Armed with such actionable intelligence, administrators and caregivers will be able to incrementally improve their performance.

In so doing, the hospital of the future will be able to deliver care faster, safeguard patient safety, empower more human resources to be applied at the point of care and reliably count on a steady reimbursement revenue stream. While laudable goals, their application will be limited if the approach and means to achieving them are too costly. Fortunately, the deployment of cost-effective automation solutions can deliver significant increases in productivity and safety while improving clinical outcomes.

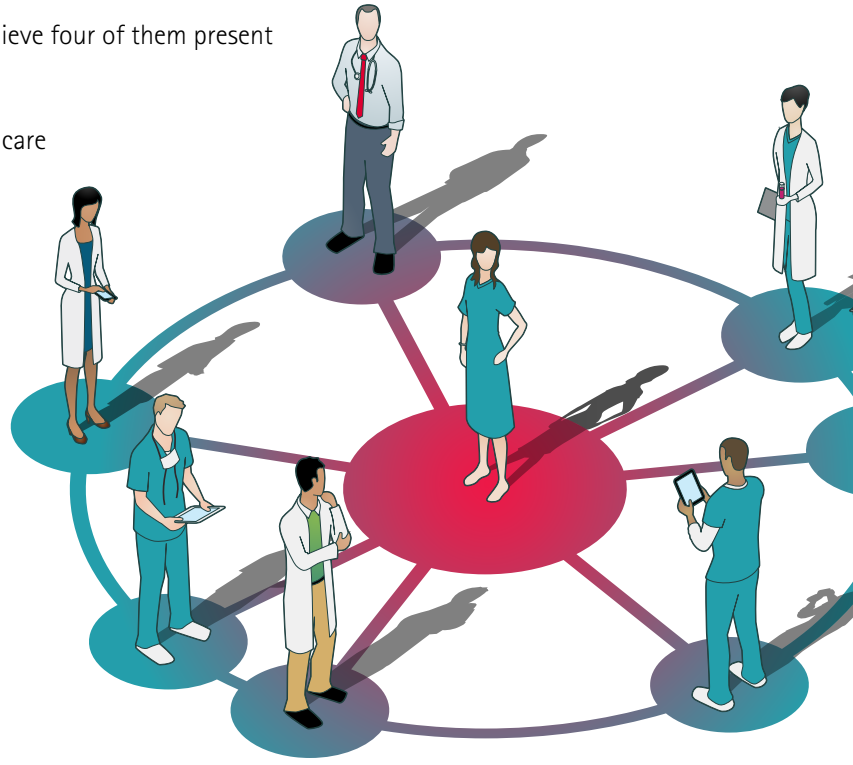
Part I of this paper details the drivers that are transforming hospital environments. Part II discusses the ramifications of these drivers along with viable strategies to overcome them. In Part III, we discuss how automated material handling solutions can cost-effectively bring these strategies to fruition to transform your 21st century hospital into the patient-centric hospital of the future.

Part I: Disruptive Drivers Shaping the Hospital of the Future

While many drivers inform the healthcare landscape, we believe four of them present the greatest impact. These are:

1. Care-delivery paradigm shift towards patient-centered care
2. Dramatic demographic changes
3. Unsustainable increases in care delivery costs
4. Projected healthcare labor shortages

The following discussion details each trend in turn.



The paradigm shift towards patient-centered care

A profound swing has occurred in patients' expectations of their caregivers, due in part to the quantitative increase in the number of provider facilities and networks available to them. Today, patients can choose among hospitals and clinics (in the United States and abroad,) for in-patient and out-patient procedures, as well as homeopathic and other alternative care providers. This trend has promoted the

commoditization of care, driving providers to differentiate themselves not just on price, but on treatment outcomes as well.

A more powerful development, however, is the proliferation of healthcare information along with the technologies and tools that make it easy to consume it. In a forward-looking treatise on the state of healthcare in 2020, Bain and Company concluded that, "Search engines have produced a vast engaged patient population we could not have imagined even 10 years ago..."[1] A Pew Research poll was more specific, finding that:

- "80% of Internet users search for health information online."[2]
- "44% of internet users look online for information about doctors or other health professionals."[3]
- "36% of internet users look online for information about hospitals or other medical facilities."[4]

Consumer demand for comparative, outcome-based statistics has been met with an explosion of quantitative websites, as illustrated in Table 1. To find *qualitative* data, consumers need go no further than online forums and mainstream social media outlets.

Informed consumers naturally gravitate towards providers who deliver the best care that they can afford.

WEBSITE	AVAILABLE METRICS
Consumer Reports Hospital ratings by US state.	- Safety score - Bloodstream infections - Avoiding readmissions - Drug information - Surgery adverse events
Medicare	- Timely and effective care Readmissions, complications and deaths - Use of medical imaging - Survey of patients' experiences - Number of Medicare patients - Medicare payment
UCompare Healthcare	- Facility information - Patient satisfaction - Payment - Readmission rate - Mortality rate - Quality measures
Healthcare Reviews Hospital, clinic and nursing home reviews by patients	- Overall rating - Knowledgeable - Wait times - Cost - Approachable

Table 1: Representative sample of consumer-centric information about hospital performance.

[1] Eliades, George, et al, "Healthcare 2020," Bain and Company, June 15, 2012, p. 5.
[2] Fox, Susanna, "Health Topics: 80% of internet users look for health information online," Pew Research Center. February 1, 2011, p. 5.
[3] Fox, Susanna, "Health Topics: 80% of internet users look for health information online," Pew Research Center. February 1, 2011, p. 18.
[4] Fox, Susanna, "Health Topics: 80% of internet users look for health information online," Pew Research Center. February 1, 2011, p. 18.

Patient-Centered Care Defined

At its core, patient-centered care focuses on achieving the best clinical outcomes. Conceptually, this is consistent with hospitals' missions and their staffs' desires. However, traditional metrics by which success was measured, and reimbursements made, were not. Consequently, new metrics have been introduced to define success.

In a nutshell, governments, insurance companies and providers are moving:

...*away* from reimbursements for "**inputs**":
- # of procedures
- # of tests
- # of physician visits

...and *towards* reimbursements for "**outputs**"[5]:
- Clinical outcomes
- Patient satisfaction
- Overall cost savings

The hospital economic "inputs" model is "driven by the volume of services provided and a fee-for-service reimbursement [schedule]," while the "outputs' model is "concerned with value: the cost and quantity of care necessary to produce desired health outcomes..."[6] Figure 1 below compares the two approaches as applied to an example of joint replacement surgery.[7]

JOINT REPLACEMENT SURGERY REIMBURSEMENTS

"Input-Centric" Model Rewards:	"Output-Patient-Centric" Model Rewards:
✓ # Of coding of surgeries ✓ # Of office visits ✓ # Of implants ✓ Avoidable readmissions and complications = more input	✓ Positive clinical outcome ✓ Care delivering savings ✓ Quality improvements ✓ Use of best practices **Penalized for:** ✓ Avoidable readmissions and complications

Figure 1: Defining payer reimbursements according to an input or output economic model.

Note that the output-patient-centric economic model includes items that both patients and payers favor. These stakeholders alone account for a large share of the momentum driving patient-centric care. A more powerful force however, is the American federal government, along with the respective state agencies. To these entities, patients aren't stakeholders, but rather constituents to whom they are accountable at the ballot box. This has prompted governmental agencies to take meaningful action.

Government policies have institutionalized patient-centric care

In 2006, President George W. Bush issued Executive Order 13410 with the objective of "Promoting quality and efficient health care..."[8/9] Of interest here is Directive "(d) Promoting Quality and Efficiency of Care." It specifies the adoption of ways to promote "high-quality and efficient healthcare," including "pay-for-performance models of reimbursement."

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[5] Eliades, George, et al, "Healthcare 2020," Bain and Company, June 15, 2012, p. 1.
[6] "Hospitals and Care Systems of the Future,"American Hospital Association, September, 2011, p. 8.
[7] "Hospitals and Care Systems of the Future,"American Hospital Association, September, 2011, p. 8.
[8] Bush, George W., President of the United States, "Executive Order 13410: Promoting Quality and Efficient Health Care in Federal Government Administered or Sponsored Health Care Programs," August 22, 2006.
[9] Section 3 of the Order details four directives which have become known as the "Four Cornerstones" of value-driven healthcare. See for example, http://www.washingtonmonthly.com/ten-miles-square/2012/02/the_four_cornerstones_of_value035602.php, and http://theincidentaleconomist.com/wordpress/the-four-cornerstones-of-value-driven-health-care/.

By 2008 the US federal Medicare program embraced this approach by ending reimbursements to hospitals for hospital-acquired conditions, colloquially referred to as "no pay for preventable events."[10] The passage of the Affordable Care Act (ACA) in 2010 sought to build upon this foundation, with a major goal of improving the quality of healthcare in the United States.[11]

It is clear that the federal government, regardless of which party holds the majority, has demonstrated bi-partisan support for, and institutionalized its commitment to, patient-centered care. This guiding philosophy has permeated government healthcare provider reimbursement models and established itself within the private-sector as well.

Demographics

The dual trends of increased longevity and lower birthrates are increasing the average age of global populations. Demographic studies bear this out, predicting that by 2030, the number of elderly in the United States will rise by 40 percent while the number of people over the age of 80 will increase by more than 100 percent worldwide.[12] This means demand for hospital-provided healthcare will significantly increase over the coming decades.

That "quantitative" challenge (number of patients) is compounded by a foreseeable "qualitative" challenge (type and severity of ailments) as well. Not only will older patient populations be larger, they will also experience an "increased prevalence of injuries, disorders and diseases" along with "increases in life-long conditions including diabetes, autism, obesity and cancer…"[13]

Thus the number of patients consuming healthcare resources will increase at the same time that the number and severity of their illnesses rise. This has profound implications for existing treatment models. Specifically, hospitals won't be able to economically scale to address future population needs without undergoing profound increases in productivity and efficacy.

Escalating costs

The sum total of National Health Expenditures in the United States, while slowing in recent years, remains on an unsustainable trajectory as Table 2 below illustrates.

Year:	1990	2000	2010
Spending in US$ (billions):	724	1,377	2,600
% increase since 1990:		90%	259%

Table 2: US National Health Expenditures.[14]

Healthcare costs alone rose by 259 percent. Add to that price increases for necessities (food, energy, housing) and "upward mobility" (education, consumables etc.) Now compare that to worker wages, which rose by only 101 percent during the same period.[15] This is happening at the same time that private-sector employers and federal, state and local municipalities are being pressured to rein in healthcare cost obligations or risk breaking the promises made to employees and constituents.

> The inevitable conclusion is that the ability of hospital patients to pay for care is being outpaced by increases in the costs of that care.

This leaves hospitals in a losing strategy of chasing those fewer patients who can pay. We believe the long-term interests of hospitals and patients alike are better served by finding ways to bend the care-delivery cost curve downward.

[10] HEALTH CARE AT THE CROSSROADS: Guiding Principles for the Development of the Hospital of the Future. The Joint Commission, 2008, p. 12.
[11] Dinsmore & Shohl, LLP, "Breaking Down the Affordable Care Act," The National Law Review. Friday, June 11, 2010.
[12] "A Roadmap for U.S. Robotics From Internet to Robotics," Robotics Virtual Organization (Robotics VO). March 20, 2013, p. 30.
[13] "A Roadmap for U.S. Robotics From Internet to Robotics," Robotics Virtual Organization (Robotics VO). March 20, 2013, p. 30.
[14] Source: Centers for Medicare and Medicaid Services, Office of the Actuary, National Health Statistics Group. For full chart, see Young, Jeffrey, 14 "Health Care Spending Growth Is Slow For Third Straight Year: Report," huffingtonpost.com, Jan. 7, 2013.
[15] Social Security Administration, Average Wage Index., Wage Average Amount figures: 1990-$19,857.45; 2010: 39,959.30.

Projected labor shortages

Current trends suggest that the usual strategy to meet increased demand for healthcare services—adding more caregivers—may not be viable in the future. A review of recent studies projects long-term shortages of US physicians and nurses totaling 155,000 and 500,000 respectively, by the year 2025.[16]

While these figures concern hospital administrators, the current economic climate has had the opposite effect. In an effort to realign expenses with lower insurance reimbursements and fewer in-patient visits, hospital administrators have had to lay off thousands of employees.[17]

Unfortunately, caregiver shortages have negative consequences. On this subject, there is "**a robust research literature documenting an association between more favorable nurse staffing and a range of patient outcomes** including mortality, adverse events and satisfaction with care."[18]

The research includes, but is not limited to:

- Aiken LH, et al. "The effects of nurse staffing and nurse education on patient deaths in hospitals with different nurse work environment." Med Care 2012;49:1047–53.
- Aiken, LH, et al. "Patient safety, satisfaction, and quality of hospital care: cross-sectional surveys of nurses and patients in 12 countries in Europe and the United States." BMJ 2012;344:e1717.
- Kane RL, et al. "The association of registered nurse staffing levels and patient outcomes. Systematic review and meta-analysis." Med Care 2007;45:1195–204.
- Needleman, J. et al. "Nurse staffing and inpatient hospital mortality." N Engl J Med 2011;364:1037–45.

Beyond poorer patient outcomes, shrinking nursing staffs have been linked to "missed care," defined as the omission of nursing care activities due to time pressures. In one study, "The most common activities identified as missed were: comfort/talking with patients (66%), educating patients (52%) and developing or updating nurse care plans (47%)."[19]

What's relevant here is that each of these activities may be directly related to patient-centered care "outputs" (including patient satisfaction surveys) and consequently, to reimbursements.

From these findings, we conclude that there is no substitute for the presence of qualified doctors and nurses at patients' bedsides. However, that puts hospital administrators in a vise—being squeezed between projected caregiver shortages on one side, and needing, for now, to cut caregivers to remain profitable on the other.

Our experience has shown that solving this dilemma is possible. **It is possible for hospitals to increase both the number of labor hours current caregivers spend with patients and liberate budget dollars to hire more of them.** The hospital of the future does both of these things and more. How it does this is the subject of Parts II and III.

[16] Zywia, Walt, "U.S. Healthcare Workforce Shortages: Caregivers," Computer Sciences Corporation, Healthcare Group, May 2013.
[17] Davidson, Paul and Hansen, Barbara, "A job engine sputters as hospitals cut staff," USA Today, October 13, 2013.
[18] Tubbs-Cooley, Heather, L., et al, "An observational study of nurse staffing ratios and hospital readmission among children admitted for common conditions," BMJ Qual Saf 2013;22:735-742, May 7, 2013.
[19] Ball, Jane E, et al, "Care left undone' during nursing shifts: associations with workload and perceived quality of care," BMJ Quality & Safety Online, first, published on 29 July 2013, p. 4.

Part II: Critical Implications for the Hospital of the Future

The consequences of the aforementioned industry drivers are twofold.

1. In order to establish consistent reimbursements, plus acquire and retain paying patients in a competitive marketplace, hospitals must realign their operations to embrace patient-centric care.

2. Secondly, in order to remain profitable, and affordable to patient populations, hospitals must dramatically improve their operational efficiencies and employee productivity.

We advocate the use of three core strategies to achieve these ends. They are:

- Apply more caregiver labor hours at the patient's point of care
- Revise processes to lower costs while improving care
- Leverage automation solutions

Apply more caregiver labor hours to serving patients

Figure 2 details our view of what patient-centered care looks like in the hospital of the future.

The patient experience is at the center of hospital activities, with caregivers focused on the effective delivery of diagnosis and treatment services. To ensure the best patient outcomes, hospitals optimize the process of care – direct care workflows and the processes that underpin them.

Note that the patient experience is tied also to the hands-on experience that patients have with doctors, nurses and everyone else they come into contact with. Second only to treatment, the hands-on nature of care plays a major role in determining patient satisfaction scores, which, in part, will affect reimbursements. The functions that hospital pharmacies, labs, central supply, the laundry and food service play are also vital. But patients don't always see the personnel that deliver these services. Consequently, they are unlikely to consider them in their evaluation of their hospital experience.

Given the importance of the hands-on experience, flourishing hospitals of the future will focus more caregiver labor hours to hands-on, point-of-care activities. That presents a conflict, as we've already established that hospital headcounts are likely to remain flat, at best. One solution is to reduce or eliminate caregiver hours currently being applied to lower-value tasks and reassign them to higher-value, hands-on activities. Our experience shows that the implementation and use of automated solutions is essential to accomplishing this objective.

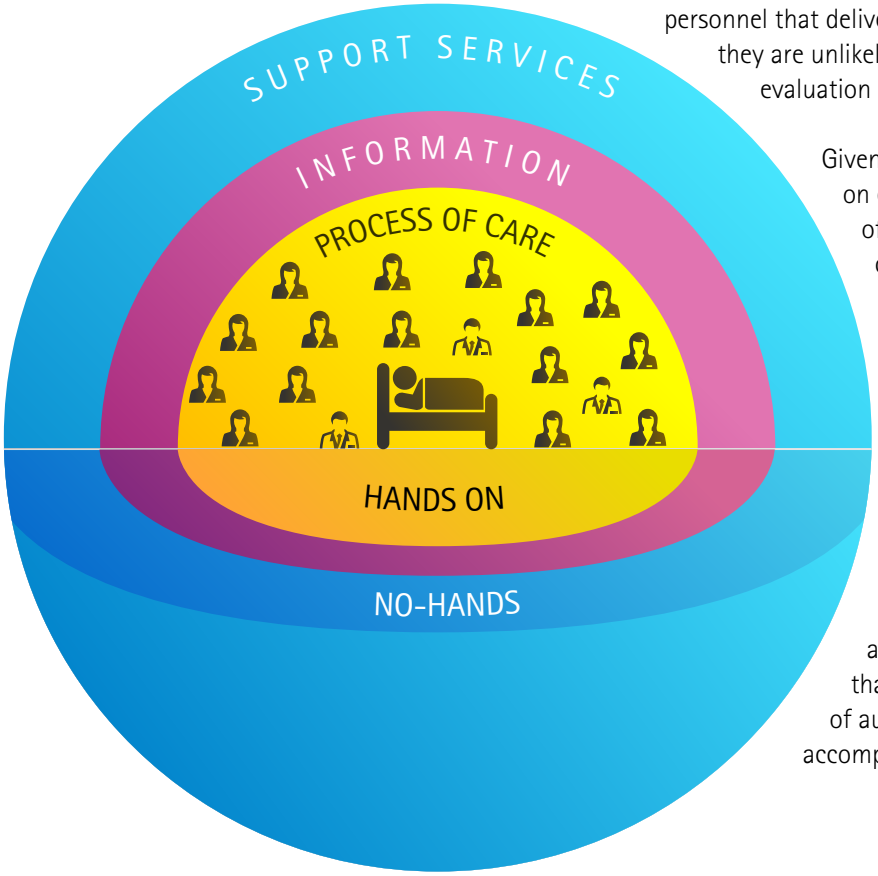


Figure 2:
Patient-centered care in the hospital of the future.

[20] Eliades, George, et al, "Healthcare 2020," Bain and Company, June 15, 2012, p. 5.

Improve processes to lower costs and improve care

The delivery of hands-on care is based upon established workflows. Hospital administrators, patients and caregivers alike have a vested interest in the adoption and application of best practices. The hospital of the future leverages peer-reviewed clinical studies, along with the collective experience of caregivers, hospitals and consultants to do just that. In fact, this is an ongoing trend in medicine. Some analysts refer to the "professionalization of medical care processes"[20] as "protocolization" because providers are "accepting and using more standardized protocols and guidelines for treating their patients."

Workflows, along with the processes that underpin them, are the means by which protocols are implemented. This offers hospital administrators an opportunity to both lower their operating costs and improve the care they deliver. By making workflow improvements—ones that deliver the same or better results while utilizing fewer or more efficient steps—you can reap significant savings. Even relatively "small" savings, multiplied by the thousands of times each workflow is executed, add up to noteworthy savings.

This is easier said than done, given the complex nature of hospital environments today. The analysis and revision of existing protocols in an economical way that avoids unintended consequences—is an exercise that requires knowledge and experience. Consequently, we strongly recommend that hospital administrators seek the expertise of skilled healthcare industry consultants who meet three primary criterion. These are:

1. **People skilled in the application of solutions that collect, analyze and use actionable data.**
   By gaining granular visibility into your operations, you'll be able to make decisions that positively impact your performance.

   As a result you can identify low value-add activities, like the movement of materials to and fro by nurses, and apply less-in-demand resources to perform those tasks. Alternatively, you can replace time-consuming, manual processes with effective and cost-efficient automated solutions.

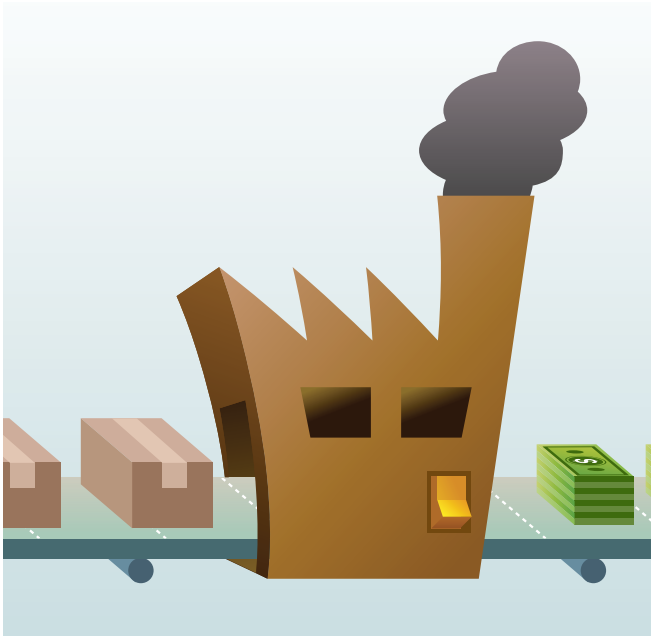
2. **People who understand workflows and their foundational processes as applied to hospitals.**
   When revising healthcare protocols, details matter. Only consultants with a deep understanding of how your systems work, along with an exhaustive track record of successful process improvement for other hospitals can deliver the results that you seek.

3. **People who understand how to measure and achieve patient-centered success metrics.**
   By partnering with experts who share your vision of the hospital of the future, you position your hospital to meet patient-centric standards and therefore, to be known in your community as a leading provider.

[20] Eliades, George, et al, "Healthcare 2020," Bain and Company, June 15, 2012, p. 5.

Leverage automation to lower costs and improve care

We believe that the implementation of automated solutions in general, and automated material transport solutions in particular is a foundational design element of all hospitals of the future. We base this assertion on the tremendous success and growth we're already witnessing in this area as leading hospitals prepare themselves today for the patients of tomorrow.



Transparency Market Research projects that the pharmacy automation systems submarket alone will reach $7.8 billion by 2018, from its total of 4.7 billion worldwide in 2011.[21] Total automated material transport sales in the same year were $15.5 billion, 18 percent higher than the year before.

This sales growth is a leading indicator of the strategic attention that hospital administrators are paying to their supply chain operations. Consider the observation by Modern Materials Handling Executive Editor Bob Trebilcock:

> "Increasingly, organizations that never thought of themselves as supply chain organizations are looking to best practices in materials handling equipment and technologies to improve operations that aren't necessarily industrial. *When they do, they are reducing their labor costs while improving accuracy and turnaround times.*"[22]

Hospitals are further optimizing the efficiency of their supply chain by centralizing core functions such as the pharmacy, lab, meals, etc., at a single site and leveraging an automated material transport strategy for the internal transportation of payloads.[23]

This data underscores the current macro movement towards automated material transport solutions in hospital environments. In Part III, we consider the questions, "Why should I consider automating material transport?" and "What are the specific benefits my hospital can gain?"

[21] "Report Predicts Growth in Pharmacy Automation Market," Pharmacy Times, Thursday, April 18, 2013.

[22] Trebilcock, Bob, Executive Editor "Automated materials handling and data collection systems are transforming the health care supply chain." Modern Materials Handling. April 1, 2012, p. 38.

[23] See for example, Kreysa, Ulrike, et al, "GS1 Healthcare Reference Book 2011/2012: Transforming the Healthcare Supply Chain," GS1.org, May, 2011, p. 27.

Part III: Leveraging Automated Material Transport to Improve Patient-Centered Care

Much of the transport of materials throughout hospitals is highly repetitive and predictable. So repetitive in fact, that the number of transport payloads moving pharmaceuticals, lab specimens, blood, clean linens, hot meals or removing waste add up to tens of thousands annually.

At the operational level, material transport automation can be categorized according to payload weight ranges, as different technologies address different needs (see Table 3). Moreover, the weight ranges are generally associated with the transport's primary purpose.

For example, the bulk of patient-specific payloads—including pharmaceuticals, lab specimens and IV bags—may be sent via "light" transportation systems.

In many hospitals, these tasks are performed by hand, consuming precious pharmacy and nursing labor hours that are already in short supply.

PAYLOAD	PRIMARY TRANSPORT APPLICATIONS
Light (up to 25 lbs)	- Pharmaceuticals - Lab specimens - Small supply items - Patient and administrative paperwork
Medium (26-60 lbs)	- Medical records - Central supply items - X-ray film - Intra-lab transport of specimens - Bulk Pharmaceuticals
Heavy (61-800 lbs)	- Hot meals and empty trays - Clean and soiled laundry - Bulk central supplies - Surgical supplies - Bio-hazardous waste

Table 3: Hospital material payloads by weight.

Thus, automated material transport solutions that combine software applications with robotics offer a viable, efficient, cost-effective, safe and predictable alternative to manual delivery processes. Specifically how these benefits are achieved is detailed in the next section.

Significantly improves the delivery of your patient-centered care

One of the strongest advantages of automated material transport solutions is that they help managers optimize the use of caregiver hours. In practice, automation shifts labor hours that caregivers currently devote to menial tasks towards hands-on, high-value activities. Automated transport solutions also foster better clinical outcomes. Best of all, these solutions do their jobs while enhancing the safety and consistency of diagnosis and treatment activities.

Reassign labor hours to high-value, hands-on, point-of-care activities

In a study by the US Agency for Healthcare Research and Quality (USAHRQ,) an automated material transport solution was evaluated for its effectiveness in delivering light, pharmaceutical payloads. Researchers found that, **"The system freed up 6,123 hours for nurses [annually] by reducing time spent tracking or retrieving medications."**[24] In turn, the recaptured labor hours:

- Allow nurses to dedicate more time to hands-on activities:
  - Improve clinical outcomes (e.g., see Projected labor shortage and the literature discussion about mortality rates)
  - Increase patient satisfaction

- Combat projected labor shortages: in the hospital example above, the nursing staff can collectively do three FTE's more work without hiring any additional caregivers

[24] "Hospital Pharmacist Staff Use Robotic Medication Transport System To Reduce Delivery Time and Costs, Enhance Nurse Efficiency and Satisfaction," U.S. Agency for Healthcare Research and Quality. October 09, 2013.

Improve the delivery of care to promote better clinical outcomes

The implementation of automated material transport solutions has a number of direct and indirect benefits which all improve the care hospitals deliver.

- **Process improvements**
  Deploying an automated material transport solution triggers the evaluation and optimization of hospital processes. Workflows are scrutinized to reduce the number of steps necessary to complete material transport operations, or to leverage technologies that render steps transparent to users.

- **Faster support-service turnaround times for the lab, pharmacy, ED, etc.**
  Timely delivery of payloads inspires provider teams to keep things moving along lest they become the "slow" link in the chain of care. Moreover, the shortening of turnaround times instills a meaningful sense of professional pride.

- **More stringent traceability of payloads**
  The incorporation of radio-frequency identification (RFID) and barcode technologies into automated material transport solutions enables the automated tracking of payloads. In turn, chain-of-custody may be established to a granular level allowing caregivers and administrators to track down payloads in real time; and to account for who got what, when and where, after the fact. Tracing payloads and generating automated alerts upon their arrival or misdirection yields a number of benefits:

  - Prevents "lost" payloads
  - Supports immediate processing of payloads, through software that interfaces with hospital systems and issues preconfigured event notifications and alerts
  - Lowers the incidence of diverted or stolen narcotics
  - Automatically supports the delivery of the right payload to the right place at the right time to the right person

> "In today's hospital environment, automating material handling makes economic sense—improving workflows and providing just-in-time deliveries of both critical and routine supplies; while reducing injuries, damage to facilities and the demand for manual cart movement, thereby addressing critical manpower shortages."
>
> Jeff Barber,
> Swisslog Automated Material Handling
> Product Manager

- **Faster payload delivery times**
  Automated material transport solutions markedly speed the delivery of pharmaceuticals, lab specimens and blood units, among other payloads. The USAHRQ study found that automation cut the time to deliver medications by 59 percent, from 74 minutes to 30 minutes.[25] The reliability of transports (payloads arrive as promised) increased by 23 percent while the predictability of the deliveries (how often payloads arrived in the promised time period) increased by 50 percent.[26]

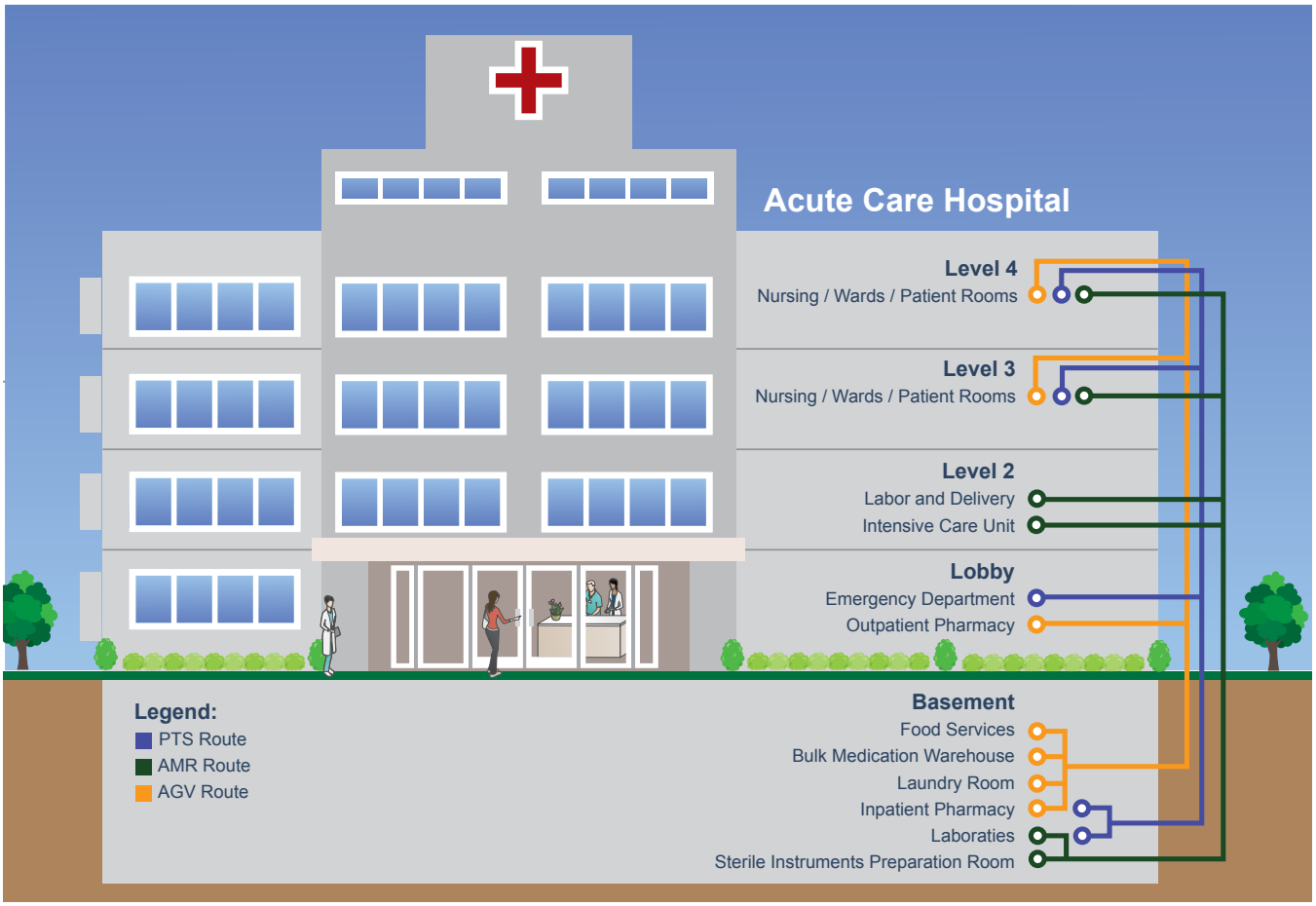
Increases the safety of patients and employees

The use of automated material transport solutions promotes the safety of both patients and employees.

- Reduces human "touches" of pharmaceuticals, lab samples, meals and other consumables to lower the risk of error, loss or contamination
- Payload delivery routes may be "segregated" to lower or eliminate the possibility of cross-contamination; for example keeping pharmacy and lab routes separated
- Reduces the incidence of employee repetitive stress injuries related to lifting and hauling activities

[25] "Hospital Pharmacist Staff Use Robotic Medication Transport System To Reduce Delivery Time and Costs, Enhance Nurse Efficiency and Satisfaction," U.S. Agency for Healthcare Research and Quality. October 09, 2013.
[26] "Hospital Pharmacist Staff Use Robotic Medication Transport System To Reduce Delivery Time and Costs, Enhance Nurse Efficiency and Satisfaction," U.S. Agency for Healthcare Research and Quality. October 09, 2013.

Lowers costs and dramatically improves your operational efficiency



At the operational level, automated material transport solutions give you two primary benefits. They lower costs and allow you to collect, analyze and develop business intelligence to make informed, operational decisions.

Automated material transport significantly lowers unit-transport costs

Research shows that automated material transport solutions yield significantly higher productivity than their human counterparts for repetitive delivery actions. For example, the USAHRQ study found that the participant hospital's automated transport solution "lowered delivery costs" by 129 percent versus the previous, hand-delivery method by a pharmacy technician.[27]

The study further noted that "the hospital has also experienced a decline in lost medications..."[28] though no hard data was available at the time of writing.

Reasons why automated material transport solutions cut costs so dramatically include:

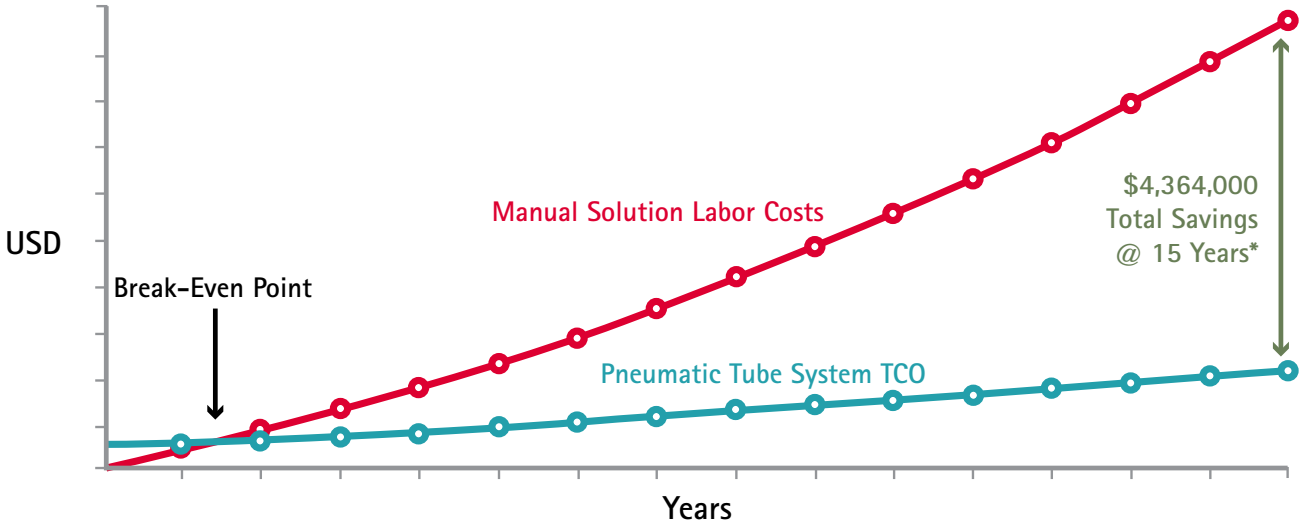
- Robots work 24 hours a day, 7 days per week
- Robots don't require benefits
- Robots automatically follow protocols and require no training
- Payload traceability significantly reduces labor hours spent, for example, tracking down/reordering/restocking "lost" medications
- While robots do require occasional maintenance and repairs, they don't incur costly injuries or facility damage
- The incremental cost to scale automated material handling to meet future demand is markedly lower than solutions that rely upon human resources

[27] "Hospital Pharmacist Staff Use Robotic Medication Transport System To Reduce Delivery Time and Costs, Enhance Nurse Efficiency and Satisfaction," U.S. Agency for Healthcare Research and Quality. October 09, 2013.

[28] "Hospital Pharmacist Staff Use Robotic Medication Transport System To Reduce Delivery Time and Costs, Enhance Nurse Efficiency and Satisfaction," U.S. Agency for Healthcare Research and Quality. October 09, 2013.

Automated material transport solutions deliver a lower total cost of ownership (TCO) than alternative human-handling solutions

Figure 3 below shows a typical TCO comparison between an automated solution and its human alternative. Note that the cost-differential increases over time.



- Average break-even point for PTS Solution < 2 years*
- Average PTS solution costs $350,000 + Annual Maintenance Costs (0.3 FTEs @ $10.45/hr + 5.6% inflation)*
- Manual solutions alternative labor costs = 10 FTEs @ 10.45/hr + 5.6% inflation*

* Based on data from average medium-size hospitals. Pneumatic tube system costs vary based on facility requirements and departmental needs.

Figure 3: Comparing pneumatic tube system TCO to a manual solution over 15 years.

Automated material transport software solutions capture intelligence to inform better decisions

The use of system data to improve processes, personnel actions and bolster security to prevent narcotics leakage contributes to reducing hospital operating costs. Automated material transport solutions work in concert with software applications designed to support them. Not only do they collect and report diagnostics data, but they capture payload transport data. The key to these applications is that they give decision makers granular visibility into their material transport operations. That's made possible by the integration of RFID technologies and accompanying system sensors that can track payloads throughout the system. As a result, administrators can identify, formulate and implement viable changes to processes based on historical data.

Historical performance data also helps managers identify specific persons, for example, who may carelessly load containers whose payloads leak or break during transport. This allows them to coach the offending person to prevent such incidents in the future. Historical chain-of-custody data is also an invaluable aid to hospital security teams. For instance, they are a highly effective tool to combat the diversion or theft of narcotics.

Summary

Consumers, payers and government entities have all embraced the patient-centered care paradigm. Thus the shift in emphasis away from "inputs" and towards "outputs" is a permanent change. Successful hospitals of the future will adapt to this reality by realigning their care delivery models and operational infrastructures to meet the new standard.

That realignment is best served by the adoption of strategies that increase the labor hours caregivers devote to hands-on, patient-centric activities. In order to counter near-term layoffs due to budget constraints, as well as long-term caregiver labor shortages, hospitals can leverage potent, automated material transport solutions.

Evidence shows that automated material transport solutions liberate caregiver labor hours so that they may be applied to higher-value hands-on care. Additionally, such solutions improve clinical outcomes, promote patient and employee safety, dramatically cut operational costs, and enable administrators to continuously improve operations via the cultivation of actionable business intelligence.

In short, automated material transport solutions optimize the use of people, processes and equipment to closely align the delivery of hospital care with patient-centric models and reimbursement schedules. By adopting and applying automation solutions in these ways, administrators are bridging the gap to become the hospitals of the future.

Steps for Success

Over more than six decades of providing healthcare solutions, Swisslog has earned a reputation as a thought leader with its visionary approach to shaping the hospital of the future. Our product roadmaps reflect deep thinking on this issue, guiding the creation of patient-centric technology and software solutions. Seasoned automation solution consultants bring pragmatic, rubber-meets-the-road, hospital-specific expertise that hospital executives require to cost-effectively implement high-value tools. Our experts stand ready to help you overcome the complex challenges you face, and guide you on your journey to becoming the hospital of the future.

Contact us today to learn more about how our proven automation solutions can help you to:

- Improve clinical outcomes
- Increase the hours your caregivers devote to patient care
- Enhance the safety of patients and employees
- Protect your investments
- Reduce operating expenses
- Ensure traceability and management of medications
- Lower the incidence of stolen/diverted narcotics

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