

Review Article

Lessons in Manufacturing Efficiency: 12 by 12

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In "Lessons in Manufacturing Efficiency: 12 by 12," we explore how manufacturing efficiency principles can revolutionize operating room (OR) management. By addressing inefficiencies and adopting strategies like throughput accounting and the Theory of Constraints, this paper proposes a model for enhancing OR throughput, quality of care, and patient outcomes. Emphasizing technology integration and systematic process improvement, we offer a comprehensive framework for transforming surgical services into highly efficient, patient-centered operations, thereby setting a new standard for healthcare delivery.

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In the nexus of healthcare delivery, the operating room (OR) is at a critical juncture where patient care and operational management intersect. Despite its significance, the efficiency of ORs is frequently undermined by outdated practices and a disconnect from fundamental manufacturing principles. This paper aims to reconceptualize the OR as a system parallel to a manufacturing facility, advocating for the integration of manufacturing principles to streamline operations and improve quality and production. We address the core inefficiencies within ORs and propose a systematic

application of these principles, charting a path toward improved productivity and enhanced patient care in surgical services."

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WHY OUR OPERATING ROOMS ARE FAILING

1. THE OR NURSE MANAGER PARADOX

At the core of hospital operations, the OR is a complex entity where clinical outcomes and operational management are deeply intertwined, affecting the economic health of medical institutions. OR managers, traditionally coming from nursing backgrounds, are tasked with overseeing these intricate systems. The transition from direct patient care to the multifaceted realm of OR management is a significant shift, requiring a broader skill set than that provided by traditional nursing education alone.

This paradox arises as these competent clinicians are thrust into roles that demand operational competencies—skills that are essential for the smooth functioning of the OR, akin to the precision required in industrial production management. This situation embodies the Peter Principle, where individuals excel in their clinical roles but may find the operational aspects of OR management challenging due to a different skill requirement set.

The discrepancy between clinical expertise and operational management proficiency can manifest as inefficiencies in critical OR functions such as scheduling, equipment management, and supply chain logistics. Addressing this gap is essential; by enhancing OR managerial roles with skills reflective of manufacturing efficiency or pivoting away from traditional OR manager nursing roles, hospitals and surgery centers can better position themselves to improve the OR's overall productivity and patient care delivery.

2. “OR CULTURE”- GROWING ORGANIZATIONAL DEBT

The term ‘organizational debt,’ introduced by Aaron Dignan (2019), metaphorically describes the accumulation of outdated practices within institutions—a challenge that is not unfamiliar in operating rooms across the country. This debt, characterized by obsolete processes, rigid hierarchies, and resistance to innovation, hinders the operating room's adaptability and efficiency.

This rigid framework invariably breeds an “OR culture” resistant to the dynamic needs of modern healthcare delivery. Each layer of bureaucracy adds friction to the OR's processes, from scheduling surgeries to managing the supply chain of critical medical equipment, to turnover times. Such frictions are not merely administrative inconveniences but can have dire consequences on patient care, throughput, and the financial viability of the institution. The operating room organizational debt encompasses more than just financial figures; it encapsulates the lost opportunities for improved patient outcomes and more efficient use of resources. Moreover, this debt manifests in the demoralization of surgeons and staff who find their expertise underutilized and their capacity for innovation underwhelmed by the weight of procedural red tape.

Overcoming this organizational debt and “culture” is essential to transitioning the OR from bureaucratic stagnation to a model of streamlined healthcare delivery, where

every process is refined for value creation and operational excellence. By adopting simple efficiency principles, the OR can mirror the efficiency transformations achieved in the manufacturing sector, enhancing patient outcomes and improving the quality of healthcare delivery.

3. THE COST ACCOUNTING CONUNDRUM AND OR THROUGHPUT OPTIMIZATION

The traditional cost accounting models in healthcare, with their centralized budgeting structures, often present an obstacle to the nuanced agility required in OR management. These models, typically imposed top-down, emphasize the inputs rather than the outputs of manufacturing efficiency. Such fiscal constraints can inadvertently trap OR managers in a perpetual state of crisis management, where the emphasis on cost-cutting undermines the very resources needed for surgical excellence and improved production.

This financial inflexibility, while aimed at expense reduction, may inadvertently lead to less-than-ideal surgical schedules, patient flows, and OR utilization. It is a paradox where the drive to decrease spending can obscure the broader objective of maximizing patient care, OR throughput, and overall production of the OR facility. To address this, incorporating throughput accounting principles that emphasize the output and throughput of overall production can shift the focus from cost-cutting to a more holistic view of profitability. By considering the rate at which the OR generates money through patient care, rather than merely cutting expenses, healthcare facilities can better align financial strategies with the core goal of enhancing OR productivity and patient outcomes.

By integrating throughput accounting into OR management, we can catalyze a transformative shift in the perception and handling of OR productivity. This model pivots the emphasis from simple cost minimization to a strategic optimization of throughput. This means prioritizing not just the speed but also the effectiveness of patient treatment and the overall efficiency of the OR processes. With this approach, the allocation of OR time becomes a dynamic and strategic decision. It's not just about the availability of slots, but also about aligning them with the efficiency and proficiency of the surgical teams. This focus on team efficiency will inherently set higher expectations for productivity within the allocated OR time, fostering a culture of excellence and effectiveness.

This refined strategy can lead to a marked reduction in idle times and a substantial increase in the volume of procedures conducted. By maximizing the use of available OR time in alignment with team performance, the approach promises to significantly boost overall productivity. Such an approach not only streamlines operations but also potentially elevates the quality of patient care by ensuring that surgeries are handled by the most proficient teams available, thereby optimizing patient outcomes and resource utilization.

DEFINING EFFICIENCY AND VALUE THROUGH A MANUFACTURING PARADIGM

Defining efficiency in the operating room (OR) is akin to understanding productivity in manufacturing: it is the optimal ratio of output to input. In the context of the OR, output is quantified by the number of successful surgeries conducted within a specific timeframe. Inputs encompass the critical components of surgical care—surgeons, patients, staff, supplies, and the OR space itself. Economic efficiency in healthcare seeks to enhance this ratio by allocating resources to maximize patient outcomes relative to costs incurred, analogous to value optimization in industrial production.

In manufacturing, efficiency is not merely a metric but a guiding principle that influences every stage of the production line. Translating this to the OR, efficiency becomes the blueprint for operational excellence, demanding a rigorous assessment and continuous refinement of each component within the surgical process. By applying a manufacturing lens, we measure OR efficiency not only in terms of the quantity of surgeries but also through the quality of outcomes and the optimization of the surgical journey—from pre-op preparations to post-op recovery. It's about creating a seamless, patient-centered production flow within the OR, where every resource is strategically utilized to enhance patient care and maximize the OR's capacity for excellence.

In the analysis of healthcare systems, Michael Porter posits that 'value' is derived from the balance between patient outcomes and the costs to achieve them. This principle mirrors the manufacturing ethos where value equates to the efficiency of production—delivering quality products while minimizing resource expenditure. Value-based care, with its focus on patient outcomes and cost-efficiency, aligns closely with manufacturing paradigms that emphasize production and efficiency. Far from diminishing the importance of throughput, value-based models encourage healthcare providers to streamline their operations, maximize resource utilization, and eliminate waste, thus promoting a higher volume of care without sacrificing quality. In this framework, efficiency becomes a catalyst for quality, driving the healthcare industry towards practices that ensure the highest standards of patient care are delivered consistently and economically.

In healthcare, as in manufacturing, volume is often a proxy for proficiency; high throughput can lead to refined processes and superior outcomes. Research substantiates that higher surgical volumes correlate with improved patient outcomes, suggesting that efficiency, specialization, and volume are interlinked components of value creation. The data further advocates for centralizing procedures like THA and TKA at high-volume centers to enhance outcomes and optimize resource use. Institutions with higher surgical volumes are poised to demonstrate and enhance quality, as volume becomes a proxy for proficiency and better outcomes. This dynamic will naturally elevate institutions with robust, efficient practices, phasing out those with lower volumes and quality. The market will favor high-performing

providers, further incentivizing the adoption of streamlined, production-oriented approaches that are the hallmark of value-based care.

EFFICIENCY PRINCIPLE #1: SETTING PRODUCTION TARGETS

Peter Drucker: "If you want something new, you have to stop doing something old."

The call for increased case volume in the operating room is a conversation that seems strangely absent in healthcare today. Unlike other industries where production targets are standard practice, healthcare often operates without this sense of urgency. Rarely, if ever, does an OR manager ask teams to consider how many more cases they can efficiently handle during their allocated block time. This lack of emphasis on production targets and the resulting underutilization of OR time is not just a missed opportunity for enhancing operational efficiency; it is also a critical oversight in a period marked by escalating healthcare costs. The absence of ownership of OR time — arguably one of the most valuable and finite resources at our disposal — is a glaring gap in the management of healthcare delivery systems. It's essential to challenge this status quo by establishing well-defined volume goals, not as mere financial metrics, but as strategic imperatives that drive the efficient and improved delivery of patient care. By aligning OR operations with clear production targets, we can ensure that our most limited resource, time, is leveraged to its fullest potential in serving patients' needs.

In the quest for efficiency, the absence of explicit production targets in operating rooms can lead to suboptimal utilization of both human and capital resources. It's a scenario that can inadvertently create bottlenecks and increase patient wait times. By setting and communicating clear volume goals, OR managers can create a more dynamic and responsive environment. This proactive approach can lead to improved patient throughput and satisfaction by ensuring that surgeries are not only scheduled but also executed with maximum efficiency and minimal delay. Therefore, engaging surgical teams in discussions about volume goals becomes not just a managerial task, but a collaborative effort towards enhancing overall service delivery.

The potential of an operating room is best realized when its activities are aligned with specific, measurable targets. These targets catalyze a shift in focus from managing costs to optimizing outcomes and patient care. When OR teams are aware of the production goals, they are better positioned to prioritize procedures, streamline processes, and reduce waste — all of which contribute to the overarching aim of healthcare: delivering high-quality patient care in a cost-effective manner. In setting these targets, we are not simply chasing numbers; we are striving to ensure that the OR operates at the zenith of its capabilities, delivering exceptional care that meets both the health needs of the patient and the operational demands of the healthcare facility."

TAKE HOME MESSAGE: *To transform patient care, we must set clear production goals; without targets, we aim at nothing and hit it every time.*

EFFICIENCY PRINCIPLE #2: THE TRANSFORMATIVE POWER OF TIME TRANSPARENCY

Peter Druker: "Time is the scarcest resource and unless it is managed, nothing else can be managed."

Time transparency is an operational principle that underpins the effective allocation and utilization of time resources within an organization. It necessitates rendering time-related data both accessible and intelligible to all members of the workforce, thereby laying the groundwork for significant enhancements in efficiency, productivity, and resource distribution. By providing a clear view of how time is expended across various tasks and processes, an organization can uncover critical insights into operational dynamics.

Leading technology firms exemplify the adoption of time transparency with tools such as Work Insights. Google, for instance, leverages this technology to fine-tune the balance between meetings and productive hours, driving team productivity (Lardinois 2018). Similarly, Amazon harnesses detailed time tracking analytics to refine their order fulfillment processes, optimizing warehouse functions and delivery schedules to elevate customer satisfaction ("Guide to the 5 Most Important Ecommerce Fulfillment KPIs" 2023).

In the manufacturing sector, time transparency is indispensable for augmenting production efficiency and honing resource allocation strategies. Advanced tracking systems empower manufacturers to pinpoint and rectify bottlenecks and process inefficiencies. Techniques integral to the Toyota Production System, like Kanban, Andon, and Heijunka, underscore the significance of visible and accessible time metrics, ensuring that personnel at all organizational levels are privy to pertinent temporal information (Womack and Jones 2011).

In the context of healthcare, particularly within operating rooms, the principle of Radical Time Transparency can revolutionize the standard of care. By implementing a system that provides surgical teams, support staff, and patients with live updates on procedural milestones, patient logistics, and resource distribution, an ecosystem of accountability, collaboration, and continuous improvement is fostered. Such a system not only facilitates informed decision-making but also elevates resource management and patient outcomes, thereby augmenting the efficiency and effectiveness of Ambulatory Surgery Centers (ASCs).

TAKE HOME MESSAGE: *Measure twice, cut once – apply this wisdom to time management by tracking and analyzing time use to make every minute count in boosting productivity.*

EFFICIENCY PRINCIPLE #3: FLOW THROUGH THE PATIENT JOURNEY

W. Edwards Deming: "Efficiency is doing better what is already being done."

In the operating room (OR), 'patient flow' mirrors the concept of industrial flow, mapping a patient's journey from preoperative preparations through to postoperative recovery. It's crucial to not only chart this journey but to meticulously time each phase, much like Henry Ford's revolutionary assembly line that dramatically reduced car assembly time. This allows for continual refinement of the process (Dave 2020).

Flow isn't merely about the sequence of steps; it's about orchestrating the patient's entire surgical experience to ensure smooth transitions, minimal waits, and seamless handovers between each stage. By enhancing patient flow, we aim to boost operational efficiency and throughput, reduce costs, and, vitally, elevate the patient experience by making the surgical process less daunting and more streamlined. Every aspect, from parking to post-op, must be coordinated and purposeful to the patient.

To achieve this, leveraging cutting-edge technology alongside comprehensive staff training is essential. These tools and educational programs serve to continuously refine scheduling, patient tracking, and procedure preparation. Automation and technological aids facilitate rapid transitions and enhance the experience, reflecting an assembly line's efficiency. Well-designed staff training empowers the team with the skills necessary for effective role management and patient flow optimization.

The benefits of refining patient flow are twofold: elevating patient satisfaction and enhancing healthcare facility operations. An efficient patient journey minimizes wait times and delays, contributing to a more positive patient perception. Research by Nottingham, Johnson, and Russell (2018) indicates that timely care correlates with higher patient satisfaction, which can also promote better post-operative outcomes and increase referrals. Ultimately, the pursuit of optimal patient flow in ambulatory surgical centers transcends operational excellence, embodying the heart of patient-centered care and a superior outpatient experience.

TAKE HOME MESSAGE: *Streamline the patient's OR journey with the precision of a well-rehearsed symphony, where every moment is optimized, ensuring not just better care but a better experience for all.*

EFFICIENCY PRINCIPLE #4: THEORY OF CONSTRAINTS

Steve Jobs: "Great things in business are never done by one person; they're done by a team of people."

Eliyahu M. Goldratt's Theory of Constraints (TOC) posits that in any complex system, like a manufacturing line or an operating room, progress is limited by the system's slowest component i.e. the constraint or bottleneck. In the context of the OR, the primary constraint is always the surgeon. Recognizing the surgeon as the primary constraint is not to assign blame as the reason for inefficiency but to strategically focus on enhancing the system's throughput.

According to TOC, once the primary constraint is identified — in this case, the surgeon — the next steps are to exploit and subordinate. Exploiting involves ensuring that the surgeon's skills are utilized to their fullest potential without idle time. It means meticulously planning and coordinating so that each moment they have is dedicated to

operating. It's about anticipating needs, pre-empting challenges, and streamlining communication. Every instrument must be ready, every team member prepared, every process from admission to discharge, honed to support the surgeon's central role. Subordination means aligning all other processes and resources to support the surgeon's capacity, minimizing delays and inefficiencies. It's about creating synergy where every process, whether it's sterilization of equipment, the availability of OR rooms, or the efficiency of support staff, is aligned with the surgeon's activity to ensure continuous flow without bottlenecks.

Thus, by framing the surgeon as the primary constraint, we construct an environment that prioritizes their workflow. This is not merely about efficiency but about creating a domino effect that benefits the entire patient care continuum. All elements, from pre-op to recovery, are orchestrated to ensure that when the surgeon is ready to perform, every other piece of the puzzle is in place. This includes prepping surgical instruments, managing turnovers, and coordinating patient preparation, all to maximize the surgeon's active operating time.

By channeling resources and support to optimize the surgeon's workflow, we enable smoother transitions, reduced wait times, and improved throughput — ultimately leading to a more efficient and productive OR environment. Goldratt's principles guide us to understand that by optimizing the primary constraint, we elevate the entire system."

This approach stays true to the TOC by focusing on the surgeon as the pivotal point of efficiency in the OR and emphasizes the importance of structuring the system to support this key constraint for overall improvement.

Given the surgeon's pivotal role in overall flow of the system, Goldratt's principles dictate that all resources should be marshaled to support, enhance, and streamline the surgeon's workflow or in other words, exploiting it to maximize the capacity. This includes ensuring that surgical instruments are prepped and ready, ensuring quick turnovers between cases, optimizing patient preparation, and guaranteeing that all support staff are trained to anticipate the surgeon's needs. A surgeon should have no idle time and should walk from room to room with patients prepped and ready for the next case. By focusing on alleviating any impediments in the surgeon's path, the entire system stands to benefit. Enhancing the efficiency of this primary constraint can result in reduced waiting times, increased patient throughput, and a more streamlined and productive operating room environment.

TAKE HOME MESSAGE: *Identify the surgeon as the central gear in the OR's clockwork; streamlining their workflow is the key that winds the clock, setting all other gears in motion for timely, efficient patient care.*

EFFICIENCY PRINCIPLE #5: DRUM-BUFFER-ROPE THEORY

James P. Womack: "Complexity is the enemy of execution. Controlling complexity is the essence of strategy."

The Drum-Buffer-Rope (DBR) system, conceptualized by Dr. Eliyahu M. Goldratt, is a manifestation of the Theory

of Constraints adapted for scheduling and production control. In DBR, the 'drum' is the heartbeat of operations — the constraint that dictates the flow and tempo. Within the OR, this is symbolized by the surgeon, whose expertise and efficiency determine the cadence of patient care. The system's overall productivity is tethered to this 'drumbeat,' with the primary objective to maximize the surgeon's operating time.

Adjacent to the 'drum' is the 'buffer,' which in healthcare translates to having patients in a state of readiness, ensuring that the surgeon's time is utilized without interruption. This buffer safeguards against variability and prepares the system for unforeseen events, thus maintaining the integrity of the surgical schedule. It's a strategic reserve that enables the OR to adapt and respond, aligning preparatory tasks such as anesthesia or sterilization to be completed just in time for the surgeon's intervention.

The 'rope' in this context is the synchronization and communication across the OR, a system of signals and alerts that harmonizes the upstream and downstream activities with the surgeon's workflow. It's an orchestrated sequence where each preparatory step is timed to the needs of the 'drum,' allowing for a seamless transition between surgeries. This coordination is crucial — from patient check-in to post-anesthesia care — ensuring that resources are mobilized efficiently, and the rhythm of patient flow is uninterrupted.

Through the lens of DBR, we view the OR not as isolated elements but as a cohesive system where timing, preparation, and communication converge to deliver exceptional care. This comprehensive approach can lead to significant improvements in operational efficiency, patient satisfaction, and resource utilization."

TAKE HOME MESSAGE: *To ensure your operating room runs like clockwork, keep the surgeon's workflow uninterrupted - this is the drumbeat to which every other process must synchronize, ensuring a harmonious and efficient patient journey.*

EFFICIENCY PRINCIPLE #6: PARALLEL TASKS

Andrew Carnegie: "Teamwork is the ability to work together toward a common vision. The ability to direct individual accomplishments toward organizational objectives. It is the fuel that allows common people to attain uncommon results."

Parallel tasks, where multiple processes occur concurrently, not only revolutionize industries but also hold transformative potential for healthcare efficiency. The pioneering assembly line by Ransom Eli Olds in 1902, which introduced specialization and simultaneous activities, serves as a historic blueprint for optimizing workflows (Sheth and Sisodia 2002).

In the patient journey within the OR, serial tasks often lead to inefficiencies; every sequential delay amplifies, extending wait times and reducing throughput. Implementing parallel tasks in healthcare, such as simultaneous pre-surgery evaluations or preparing multiple patients for surgery at once, can markedly improve operational flow. Effective parallel tasking minimizes idle time and maximizes the use of staff and resources.

Crucial to this approach is the critical evaluation of each task along the patient journey. Considerations should include the task's necessity and timing, the feasibility of automation, the potential for completing the work on a different day, and opportunities for task concurrency. Assigning tasks should be strategic, matching staff expertise with specific responsibilities and exploring delegation options to enhance cost-efficiency and effectiveness. By identifying tasks that can be completed in parallel and streamlining their execution, healthcare facilities can significantly elevate patient and staff satisfaction and overall quality of care.

Parallel tasks in the OR, akin to the efficiencies seen on the assembly line, bring a revolutionary approach to patient care. By executing multiple steps simultaneously, such as preoperative assessments and preparing several patients for surgery, we can significantly reduce downtime and enhance the OR's capacity. This principle requires a meticulous evaluation of tasks for potential parallel execution, prioritizing the timing, necessity, and possibility of automation. Strategic task assignment, aligned with staff competencies, ensures a seamless operational flow. This synergy in the OR workflow not only boosts staff productivity but also improves the patient experience, mirroring the efficacy and collaborative spirit found in industry-leading manufacturing systems.

TAKE HOME MESSAGE: *In your OR, eliminate the unnecessary and make all other tasks concurrent.*

EFFICIENCY PRINCIPLE #7: WORK BREAKDOWN STRUCTURE (WBS)

James Clear: "You do not rise to the level of your goals. You fall to the level of your systems."

Originating from the US Department of Defense's successful implementation for the Polaris missile submarine program, the Work Breakdown Structure (WBS) offers a proven blueprint for dissecting complex initiatives into more manageable tasks. By decomposing a project into its component parts, WBS enhances clarity in project planning, resource scheduling, and cost estimation, as observed by Fleming and Koppelman (2016).

In healthcare, specifically within the operating room, WBS is instrumental in elevating productivity. The methodical deconstruction of surgical procedures into distinct phases allows for precise scheduling and improved resource distribution, streamlining the execution of tasks. WBS ensures that each step of the surgical process is meticulously planned and efficiently carried out, reducing delays and fostering a seamless experience for both patients and medical staff (Project Management Institute 2021).

The tangible outcomes of implementing WBS in the OR include:

- **Planning and Execution:** Systematic breakdown of surgical procedures into stages, resulting in enhanced efficiency and a streamlined process.
- **Role Identification and Improvement:** Clear delineation of roles within the surgical team, leading to fo-

cused performance enhancements and expertise development.

- **Parallel Task Execution:** Identification of opportunities where tasks can be performed concurrently, thus saving time and optimizing workflow.
- **Improved Resource Allocation:** Strategic management and utilization of resources to ensure availability and readiness, aligning with the precise timing of surgical needs.
- **Coordination and Monitoring:** Enhanced communication and oversight throughout the surgical procedure, ensuring that all components of the surgery are synchronized and monitored for timely progression.

In sum, integrating WBS into the operating room setting translates into a synergistic workflow, punctuality in surgical procedures, and optimal use of resources. The precise coordination and monitoring afforded by WBS ensure that every surgical operation proceeds without interruption, culminating in superior patient outcomes and heightened operational efficacy.

TAKE HOME MESSAGE: *Success hinges on our ability to distill complex environment of the OR into a series of simple, actionable steps.*

EFFICIENCY PRINCIPLE #8: SPECIALIZATION IN THE OR

Frederick W. Taylor: "The man in the planning room, whose specialty under scientific management is planning ahead, invariably finds that the work can be done better and more economically by a subdivision of the labor."

Specialization, the cornerstone of economic and industrial evolution, as posited by Adam Smith and later exemplified by Henry Ford's moving assembly line, continues to redefine efficiency in the modern era. The advent of precise, technology-driven tools has catapulted industries into a new age of productivity. In healthcare, however, the leap into specialization presents unique challenges and opportunities, especially within the operating room.

Surgeons, equipped with finely honed expertise for a focused array of procedures, depend on an operating room ecosystem that mirrors their precision. A mismatch, such as pairing a surgeon with a scrub tech who lacks corresponding expertise, not only introduces inefficiencies but risks suboptimal care. This incongruity could slow down critical processes, endanger patient safety, and inhibit the surgeon's ability to perform at their best. Future ORs must, therefore, evolve to parallel the specialization of their surgeons, ensuring that every member of the support team, and every instrument in use, is selected and trained to meet the exacting demands of specific surgical disciplines. When the OR's layout, equipment, and personnel are all fine-tuned to the requirements of each procedure, the result is an environment where clinical efficiency thrives, patient safety is prioritized, and the high standards of specialized surgeries are meticulously upheld.

The path forward, especially for ASCs, lies in aligning their operational strategies with the specialized trajectories of modern surgery. Specialized surgeons require environments conducive to their procedures—this necessitates a

transformation in equipment, technology, infrastructure, and patient care standards. Such synchronization between surgeon specialization and ASC facilities can significantly enhance surgical effectiveness and patient outcomes.

The merits of specialization in healthcare are manifold. Training healthcare professionals in specialized roles can lead to superior surgical outcomes and fewer complications (D'Souza et al. 2016). Investment in specialty-specific medical technology can revolutionize treatment efficiency, recovery times, and overall patient satisfaction. Moreover, the trend towards specialization fosters a culture of standardization and adherence to best practices, which can propel healthcare facilities to offer sophisticated, individualized patient care, corroborating the findings of the Ambulatory Surgery Center Association (2021).

By embracing specialization, healthcare facilities can reshape their approach to surgical care, ensuring that each procedure is as efficient, safe, and patient-focused as possible."

TAKE HOME MESSAGE: The OR and staff specialization must match the level of specialty of the surgeon.

EFFICIENCY PRINCIPLE #9: STANDARDIZATION

Henry Ford: "Quality means doing it right when no one is looking."

Standardization, a cornerstone of manufacturing efficiency, ensures uniformity and consistency, crucial to both industrial production and healthcare delivery. The historical evolution of standardization, from the Industrial Revolution's factory systems to Eli Whitney's interchangeable parts, underscores its significance in enhancing productivity and reducing costs. Today, global entities like the ISO continue to advocate for standard protocols across various sectors.

In the OR, standardizing implants and instruments is equally vital to streamline surgical procedures. While surgeons' individual preferences are important, uniformity in surgical tools can reduce the need for varied equipment setups, training demands, and inventory complexities—paralleling the manufacturing industry's approach to simplification and quality control.

This focus on standardization can reduce errors, save time, and facilitate better inventory management. It requires a balance between individual surgeon preferences and the efficiency goals of the healthcare facility. Collaborative standardization efforts, informed by clinical outcomes and resource utilization data, can enhance OR efficiency while maintaining the high standards of patient care."

TAKE HOME MESSAGE: Surgeons should set the efficiency precedent by selecting universal trays and instruments to signal collaborative efficiency, setting a standard that streamlines OR operations.

EFFICIENCY PRINCIPLE #10: JUST IN TIME

Benjamin Franklin: "A place for everything, everything in its place."

This quote by Franklin encapsulates the essence of organization and efficiency that JIT strives to achieve, making it highly relevant for advocating JIT principles in healthcare settings like hospitals and ASCs.

The Just-In-Time (JIT) principle's genesis in the Toyota manufacturing process marked a pivotal shift towards efficiency and waste reduction. By closely aligning production schedules with market demands, Toyota was able to minimize the overhead costs associated with large inventories and reduce the floor space required for storage. This lean approach to inventory management underscored the importance of understanding market rhythms and producing goods in precise accordance with customer demand, effectively transforming the traditional manufacturing mindset.

Today's manufacturing landscape has widely embraced JIT methodologies, recognizing the profound benefits of a demand-driven approach. Modern industries leverage JIT to not only cut down on wastage but also to streamline their operational processes, leading to tangible improvements in product quality and customer satisfaction. By focusing on delivering products as they are needed, manufacturers can operate with leaner inventories, quicker turnaround times, and a more agile response to the changing marketplace.

Applying JIT principles in the OR can streamline the entire surgical process. By ensuring that surgical tools, equipment, and implants are available exactly when needed and not before, ORs can reduce clutter and the costs associated with handling and storing these items. This approach necessitates a meticulously coordinated system where surgical teams communicate real-time needs, and supplies are procured and delivered in tandem with the surgical schedule, mirroring JIT's demand-driven approach in manufacturing.

Traditionally, hospitals and ASCs stockpile a vast array of instruments and implants, leading to inflated costs and inefficiencies. This outdated model results in excess inventory that often goes unused, requiring significant space for storage and management. A JIT approach could revolutionize this by ensuring that supplies are procured and delivered in alignment with the actual surgical schedule, thus minimizing the need for extensive on-site storage, reducing waste, and enhancing operational efficiency by reducing the overhead costs associated with inventory management.

Moreover, JIT in the OR can enhance patient flow by scheduling surgeries in a way that aligns with staff availability and resource optimization. This requires a dynamic scheduling system capable of adapting to the variability in surgical durations and patient needs. By embracing JIT, the OR can improve turnover times, reduce unnecessary preoperative waiting periods for patients, and ensure that surgeries are not delayed by the unavailability of necessary equipment or personnel.

TAKE HOME MESSAGE: To modernize and economize your OR, ensure surgical tools and implants are delivered precisely when needed, not a moment sooner by relaying demand ahead of time.

EFFICIENCY PRINCIPLE 11: THE SURGEON LEADER

Peter Drucker- “Management is doing things right; leadership is doing the right things.”

Effective surgeon leadership plays a pivotal role in enhancing OR (manufacturing) efficiency by fostering a culture of collaboration, innovation, and continuous improvement. A strong surgeon leader sets clear goals, communicates expectations, and inspires a shared vision among team members. Through strategic planning and decision-making, a leader can optimize resource allocation, streamline processes, and identify areas for improvement. Moreover, a surgeon leader encourages open communication, creating an environment where employees feel empowered to share ideas and suggestions for efficiency gains. Implementing lean principles and embracing technological advancements are key strategies that a surgeon leader can champion to drive efficiency. By investing in employee training and development, a surgeon leader ensures that the workforce is equipped with the skills necessary to adapt to evolving technologies and methodologies. Additionally, effective leadership involves recognizing and rewarding high-performing individuals and teams, thereby motivating employees to consistently meet or exceed performance expectations. In essence, a strong leader acts as a catalyst for positive change, fostering a culture of efficiency, innovation, and adaptability within the OR manufacturing environment.

Surgeon leadership directed towards efficiency involves a meticulous focus on defining clear objectives and utilizing resources judiciously. This management philosophy underscores the importance of setting measurable goals, and in the context of surgeon leadership, this translates into establishing precise surgical objectives, optimizing workflows, and minimizing waste. Surgeon leaders who embody these principles actively engage with their teams to create standardized processes that ensure consistency and reliability in surgical procedures. By fostering a culture of continuous improvement, these leaders encourage their teams to identify and eliminate inefficiencies, fostering a mindset

that values not only the outcome but also the efficiency and quality of the entire surgical process.

Furthermore, the human element in leadership aligns with the patient-centric focus required in surgical settings. Surgeon leaders, following Drucker’s principles, prioritize patient needs and satisfaction, recognizing that efficient healthcare delivery is intrinsically tied to positive patient outcomes. This involves not only effective surgical procedures but also attention to the entire patient experience, from preoperative consultations to postoperative care. Surgeon leaders incorporating these insights understand that true efficiency in healthcare is achieved when the human aspect, both in terms of the surgical team and the patients, is at the core of decision-making and operational processes.

TAKE HOME MESSAGE: The surgeon sets the tone for the OR. Prerequisites for effective surgeon leadership include strategic thinking, collaboration, a commitment to continuous improvement, and a focus on optimizing the patient experience through effective and efficient surgical practices.

CONCLUSION

As we look ahead, the OR stands on the cusp of a renaissance in efficiency, poised to benefit from the wisdom of centuries of manufacturing evolution. This convergence of disciplines heralds a new era in healthcare, one where the surgical suite operates with the clockwork precision of the finest factories, and where every resource is optimized to enhance patient outcomes. This is our call to action: to build OR systems where quality, efficiency, and care interlock seamlessly, driving towards the ultimate goal of exemplary patient care delivered within the framework of the highest operational standards.

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REFERENCES

- Ambulatory Surgery Center Association. 2021. "ASCs: A Positive Trend in Health Care." *Advancing Surgical Care*. <https://www.ascassociation.org/advancingsurgicalcare/aboutasc/industryoverview/apositivetrendinhealthcare>.
- Dave, P. 2020. "The History of Lean Manufacturing by the View of Toyota-Ford." *Int J Sci Eng Res* 11:1598–1602.
- Dignan, Aaron. 2019. *Brave New Work: Are You Ready to Reinvent Your Organization?* New York: Penguin Random House.
- D'Souza, N., D. A. Hashimoto, K. Gurusamy, and R. Aggarwal. 2016. "Comparative Outcomes of Resident vs Attending Performed Surgery: A Systematic Review and Meta-Analysis." *J Surg Educ* 73:391–99. <https://doi.org/10.1016/j.jsurg.2016.01.002>.
- Fleming, Q. W., and J. M. Koppelman. 2016. *Earned Value Project Management*. 4th ed. Project Management Institute.
- "Guide to the 5 Most Important Ecommerce Fulfillment KPIs." 2023. US MCF. <https://supplychain.amazon.com/learn/5-ecommerce-fulfillment-kpis-guide>.
- Lardinois, F. 2018. "Google's Work Insights Helps Businesses Better Understand How They Work." *TechCrunch*. <https://techcrunch.com/2018/09/18/googles-work-insights-helps-businesses-better-understand-how-they-work/>.
- Nottingham, Q. J., D. M. Johnson, and R. S. Russell. 2018. "The Effect of Waiting Time on Patient Perceptions of Care Quality." *Qual Manag J* 25:32–45. <https://doi.org/10.1080/10686967.2018.1404368>.
- Project Management Institute. 2021. *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Seventh Edition and The Standard for Project Management (ENGLISH)*. Project Management Institute.
- Sheth, J., and R. Sisodia. 2002. *The Rule of Three: Surviving and Thriving in Competitive Markets*. Simon and Schuster.
- Womack, J., and D. Jones. 2011. *Seeing the Whole Value Stream*. 2nd ed. Lean Enterprise Institute.