MIT Sloan School of Management

MIT Sloan School Working Paper 5166-16

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April 12, 2016

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Word count: 1,200 (not including references)
References: 7

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A recent publication highlighted the tensions between the "efficiency movement" and the provision of medical care. In that paper, the authors argued that attempts to transfer process-focused improvement methods -- developed by Fredrick Winslow Taylor, and refined by Toyota -- from the factory floor to the to hospital compromises the quality of care and the lives of care-givers[1]. The authors postulated that hospitals bear little resemblance to a factory, and therefore efficiency has little to offer medicine beyond a few specialized applications.

Critiques of "Medical Taylorism"[1] misunderstand Taylor's essential insights and, in doing so, forestall substantial gains in both the efficiency and quality of care that can come with its appropriate application.

Taylor is often associated with standardization, the idea that identifying and enforcing "the one best way" for doing a task leads to significant gains in efficiency[2]. His ideas have been resisted by craftspeople and professionals since they were first articulated in 1911. However, the benefit of standardization was not Taylor's fundamental insight. Instead, he realized that the conduct of work, once thought to be the idiosyncratic consequence of experience and apprenticeship, could be systematically analyzed and designed.

Taylor held an impoverished view of human motivation and capability. As a result, standardization became the main work design intervention for workers in his steel mills. Standardization remains an effective intervention for offsetting the errors that come with the automatic cognitive processing of routine tasks[3]. However, standardization is only one element of a larger work design toolkit. Standardization by itself does not necessarily reduce cost or improve outcomes.

We now know more about what kinds of tasks humans are good at, what kinds of errors we are prone to making, and which types of work are likely to engage and motivate us. With the benefit of this knowledge, we are in the position to capitalize on Taylor's insight by designing work that both leverages the strengths and offsets the limitations of the people doing it. Dynamic Work Design (DWD)[4] -- which is built on in-depth studies of multiple organizations in different industries, cognitive science and organizational studies -- offers an approach for transferring the lessons of process improvement to medicine. DWD has four basic principles.

First, well-designed work allows those doing it to regularly *reconcile activity and intent*. The human brain is an "associative machine.[5]" It is remarkably adept at matching patterns. When a task provides clear goals and feedback on progress to those goals, those doing the task will learn more effectively and find the job more satisfying.

Second, well-designed work leverages *structured problem solving*. The associative machine does not always identify the most effective solution. Deming's key insight was that structured problem solving by the people doing the work -- could be applied to improving work[6]. Structured problem solving leverages our developmental drive, reinforces a sense of control over our environment, and complements our natural propensity to match patterns observed in past experience by forcing a more disciplined, conscious consideration of the problem at hand.

Third, well-designed work provides an *optimal challenge*. A job that generates no gaps between activity and intent is boring and leads to complacency. Too much challenge however leads to corner cutting, errors and all the other maladies highlighted by critics of efficiency in medicine. The key insight embodied in the Toyota system is that this challenge can be managed and optimized.[7]

Finally, well-designed work *connects the human chain.* Direct human interaction is expensive and consumes time. In the conventional wisdom, it does not generate value. But direct human interaction is both remarkably efficient for transferring subtle, complex information and is deeply engaging. Well-designed work links the chain of people delivering an outcome to both capitalize on our natural pro-social motives and to insure that information is communicated efficiently and effectively.

A recent project at the Yale New Haven Hospital (YNHH) demonstrates how these principles can be used to solve problems, improve outcomes, and lower costs while deepening physician and staff engagement. YNHH experienced a surge in the demand for cardiovascular procedural services. Partly as a result of growth, significant delays developed across multiple patient-care environments. Anesthetized patients waited in the operating room for beds to become available in the intensive care units (ICU). ICU patients waited for beds to become available on the floors. Patients delayed in the operating rooms experienced a 13% longer ICU length of stay (LOS) when compared to similar patients who's care transition was not delayed. Staff had to work long days and weekends. Resources were utilized inefficiently and higher costs (directly attributable to delays) were incurred, directly impacting the bottom line.

To improve the movement of patients through the cardiovascular center, the course of seventy-eight patients was captured in a process-flow map. The map revealed that activity often did not produce its intended consequence and that participants lacked the regular feedback to make improvements. For example, procedures started at 7:30AM with no visibility into how many beds were available. The "bed-flow" meeting, which was designed to address this issue, didn't start until 9:30AM.

Our interventions aligned the system of care to DWD principles. The intent to move patients to the appropriate care environment in a timely fashion was reinforced and an electronic dashboard was created to provide regular feedback. The bed-flow meeting was moved to 5:30AM, and all stakeholders attended either in person or virtually. Conducting the meeting prior to starting cases matched the activity to its intent and connected the human chain of staff and physicians. Regular meetings were dedicated to surfacing and solving problems in a structured manner. For example, one group came together to develop a standardized discharge processes across the cardiovascular service that combined the "best practices" from different micro-environments.

Perhaps the most powerful design element was implementing optimal challenge. Creating complete and transparent admission and discharge criteria for each environment facilitated objective assessment -- captured in a simple color code -- of whether a patient could be discharged (green), could potentially be discharged later in the day (yellow) or could not be discharged (red). Appropriating an idea from manufacturing, the team then developed a "pull" system whereby the 5:30am meeting was used to assess the number of "green" and "yellow" beds and then determine the number the number of operations that could be started at 7:30AM.

Within a few months of identifying the problem, lengths of stay decreased by 40 to 70% across every ICU and floor. Numbers of days with delays decreased and there was no increase in ICU "bounce-backs" or hospital re-admissions. Cost per case decreased by 27%. These metrics have been sustained for eight months as of this writing.

Providers in this system experienced little restriction in their ability to deliver patient care. The people doing the work were charged with solving the problem. The system now operates with far less chaos—no more heated debates about which patient gets the bed—giving everybody *more* time to focus on patients.

Designing work to fit the humans who do the work, to capitalize on our strengths and offset our weaknesses, offers the promise of a new era in medicine, one in which all the participants are deeply engaged in delivering care that is both effective and efficient.

Bibliography:

[1] Pamela Hartzband and Jerome Groopman. Medical Taylorism. New England Journal of Medicine 2016: 374(2); 106-109.

[2] Frederick Winslow Taylor. The Principles of Scientific Management. Publisher: Dover Publications (July 8, 1997) Unabridged Dover (1998) republication of the work published by Harper & Brothers Publishers, New York, 1911.ISBN-10: 0486299880 ISBN-13: 978-0486299884

[3] Pronovost P, Needham D, Berenholtz S, Sinopoli D, Chu H, Cosgrove S, Sexton B, Hyzy R, Welsh R, Roth G, Bander J, Kepros J, Goeschel C. An intervention to decrease catheter-related bloodstream infections in the ICU. N Engl J Med. 2006 Dec 28;355(26):2725-32. Erratum in: N Engl J Med. 2007 Jun 21;356(25):2660.

[4] Dodge, S., De Smet, T., Meldrim, J., Lennon, N., Perrin, D., Ferriera, S., Leber, Z., Friedrich, D., Gabriel, S., Lander, E. S., Kieffer, D., Repenning, N. Using Dynamic Work Design to Help Cure Cancer (And Other Diseases). MIT Sloan School Working Paper 5159-16. January 14, 2016. http://mitsloan.mit.edu/shared/ods/documents/Repenning_Cancer_full.pdf&PubID=15032

[5] Daniel Kahnemann. Thinking, Fast and Slow. Farrar, Stroux and Girard. New York, N.Y., 2011. ISBN: 978-0-374-53355-7

[6] W. Edwards Deming. The Essential Deming: Leadership Principles from the Father of Quality. Publisher: McGraw-Hill Education; 1 edition (December 11, 2012). ISBN-10: 0071790225 ISBN-13: 978-0071790222

[7] Repenning, N. and J. Sterman (2002). Capability Traps and Self-Confirming Attribution Errors in the Dynamics of Process Improvement, Administrative Science Quarterly, 47, 265 – 295 on the costs of overload.