

Optimizing Patient Flow

Advanced Strategies for Managing Variability
to Enhance Access, Quality, and Safety



Edited by Eugene Litvak, PhD
Foreword by Harvey V. Fineberg, MD, PhD

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Joint Commission Resources
Oak Brook, Illinois 60523
<http://www.jcrinc.com>

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ISBN (print): 978-1-63585-039-0
ISBN (e-book): 978-1-63585-040-6

Printed in the USA

For more information about The Joint Commission, please visit <http://www.jointcommission.org>.

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Acknowledgments

I am very grateful to the authors for their valuable contributions and for their patience with my multiple requests and suggestions, which I thought were crucial and they likely believed were annoying. I am indebted to Dr. Harvey Fineberg for the foreword to this book but even more for his early recognition of the effect of optimizing patient flow on quality of care and its cost, and for his strong support of this field in his capacities as Harvard University Dean and Provost, and as the past President of the Institute of Medicine (currently National Academy of Medicine).

I wish to extend my appreciation to the contributing authors of this book: James M. Anderson, Daniel J. Beckett, John B. Chessare, Jennifer Crist-Muñoz, Mary A. Ditri, David Fillingham, Alan Forster, Katherine Ardalan Hochman, Aline M. Holmes, Martin Hopkins, Renate Ilse, Bryan Jones, Hakmeng Kang, Jack Kitts, Ellis “Mac” Knight, Daniel Kobewka, Julia L. Krol, Robert G. Lahita, Michael C. Long, David A. McDonald, Patricia A. McNamee, Penny Pereira, Patrick Rafferty, William C. Rupp, Elizabeth Ryan, Carolyn Santora,

Peter P. Semczuk, Kednapa Thavorn, Peter Viccellio, Cheri Ward, Kristy Zhou.

I am also grateful to Catherine Chopp Hinckley, the Executive Director, Global Publishing at JCR, and Helen Fry, Associate Director, Publications at JCR, for their helpful comments and suggestions. My special thanks go to Jennifer Ahearn, JCR Senior Editor. Her contributions made this book a significantly better one.

And finally, my very special thanks go to Helen Haskell for her contributions to the prologue, for her commitment to improving patient safety, for her leadership in curbing incidents of patient flow failures (similar to what happened to her son Lewis Blackman), and for her inspiration to me and many others in my field.



Eugene Litvak, PhD

President, Institute for Healthcare Optimization

Foreword

by Harvey V. Fineberg, MD, PhD

President, Gordon and Betty Moore Foundation

Former President of Institute of Medicine

Former Dean of the Harvard School of Public Health

*You can always count on the Americans to
do the right thing—after they have exhausted all the other possibilities.*

ATTRIBUTED TO WINSTON S. CHURCHILL

A recent news report brought a startling announcement from Jeff Bezos of Amazon, Warren Buffett of Berkshire Hathaway, and Jamie Dimon of JPMorgan Chase: They were taking the health care of their employees into their own hands. If they are serious, I thought, and surely they are, one of the first people they should call is Eugene Litvak. Here, in this handbook, you can learn what Dr. Litvak and his colleagues would teach them, how to apply the principles of operations research and managing the flow of patients to improve both the quality and efficiency of medical care. I suspect the concept of flow management is familiar to Amazon.

If you are a health care executive or clinical leader, there is no need for you to wait for the titans of American business to reweave the fabric of America's health care. You can disrupt your own health care institution, in the best possible way, and start right away. Through exerting your own leadership, adopting the principles of operations

management, gathering and analyzing the right data, and putting in place the teams that can implement lasting improvements in the way patient flow is managed, you can reap the benefits of better patient experience and outcomes, cost savings, and higher job satisfaction among your professional employees. If this sounds too good to be true, I urge you to read on about the approaches and successes documented by the authors in these chapters. There is no reason their success cannot be attained by every institution and system that delivers health care.

This book does not cover every useful tool and technique to improve efficiency in the delivery of care, nor does it aspire alone to be a comprehensive guide to managing the flow of patients. It is, however, an enlightening, inspiring, and deeply practical introduction to the principles and methods of managing patient flow that will reward anyone determined to improve medical care.

Introduction

by Eugene Litvak, PhD

President, Institute for Healthcare Optimization

When hospitals suffer from overcrowding, quality of care becomes far from satisfactory, infections and readmission rates increase, and clinicians burn out as they struggle to support a required level of patient safety. All this takes place in an environment of increasing health care costs.

In 2010 Joint Commission Resources published *Managing Patient Flow in Hospitals: Strategies and Solutions*, Second Edition. This book introduced the concept of streamlining hospital patient flow. Ten years later, there is a growing demand for a systematic, scientific, and practically proven approach to not only streamlining but also optimizing patient flow to improve care and reduce costs. My colleagues and I at the Institute for Healthcare Optimization are frequently approached by clinicians, hospital executives, and managers who need help in improving efficiency at their hospitals. This grave situation requires expeditious and methodical actions to move beyond the *status quo*. It also provides the primary motivation for this new book, *Optimizing Patient Flow: Advanced Strategies for Managing Variability to Enhance Access, Quality, and Safety*. This new book offers rigorous and structured guidance for optimizing patient flow. It also provides a practical road map to implementing and complying with Joint Commission Leadership Standard LD.04.03.11, which requires a systematic, hospitalwide approach to patient flow.

The intended audience for this book is varied. Hospital executives and board members, who are struggling to comply with quality of care measures while improving hospital margins, have the chance here to learn from

their peers. Four hospital CEOs tell their stories in separate chapters of this book about how to navigate the uncharted waters of changing hospital culture while defining patient safety and quality of care as an ultimate goal of health care. This book also provides physicians, nurses, other clinicians, and managers with practical ways to improve patient safety in their work environment. Decision support experts will also benefit from this book and can use it as a step-by-step manual on optimizing patient flow at their institutions.

This book covers both US and international case studies on implementing modern principles in managing patient flow and is therefore useful for health care workers around the world. While this book is a significant step forward in optimizing patient flow and hospital operations, the aforementioned *Managing Patient Flow*, Second Edition, remains an essential guide to patient flow as it affects nurse staffing and quality of care. This earlier book also contains important statistical analyses of patient demand and a very educative case study from Cincinnati Children's Hospital. Therefore, the earlier book is frequently referenced throughout this book. For someone who wants to become an expert in patient flow, these two books combined provide the key knowledge for achieving this goal.

One important issue addressed in this current book, *Optimizing Patient Flow*, is managing **health care system** flow. A hospital's inability to discharge patients who are ready to go home or to a subacute facility (rehabilitation, skilled nursing facility) is a contributing factor when it

comes to overcrowding. Indeed, if there is no place to which to discharge a patient, he or she then unnecessarily occupies a hospital bed, which in turn prevents admission of an acutely ill patient to that bed, thereby creating a patient flow bottleneck. For some hospitals, this bottleneck could be a problem of significant magnitude. While this book provides an extensive and detailed methodology for improving hospital patient flow, this approach can and has been successfully applied in outpatient settings as well.

I would recommend viewing this book as a menu with selections for different health care professionals. For example, Chapters 1–4 are very important for hospital executives who are deciding whether to undertake a large-scale patient flow project. Read the stories of CEOs who grappled with the same challenges. Those who are leading hands-on patient flow redesign efforts would greatly benefit from Chapters 5–7. Those who are still deciding whether it’s worthwhile to undertake patient flow redesign, given its technically and organizationally complex nature, should read the case studies in Chapters 8–11. Finally, for those who look beyond hospital walls to improve patient flow, Chapters 12 and 13 will be of great importance.

The book consists of a prologue and 13 chapters divided into 4 parts.

The prologue illustrates the reality in health care today and advocates for the need for properly managed patient flow. Powerful and passionate, a well-known leader in quality of care and hospital operations, Ellis Knight, MD, makes a very strong and convincing case for optimizing patient flow for quality of care and patient safety. He tells the heartbreaking story of Lewis Blackman, a talented young boy who died due in part to mismanaged hospital patient flow. What makes this case genuine and emotional is the contribution by Helen Haskell, MA, a prominent patient safety advocate and the mother of Lewis Blackman.

PART I

CEO Perspectives— Committing to Optimized Patient Flow

Chapters 1–4. Anyone in hospital management will confirm that it is impossible to implement any complex hospital project (particularly optimizing patient flow) without the strong support of the hospital CEO. However, as most CEOs have learned, it is challenging to assume the role of a real leader tasked with changing hospital culture. The first four chapters detail the different experiences of four hospital CEOs who have succeeded in streamlining patient flow. These are former CEO of Cincinnati Children’s Hospital Medical Center, James M. Anderson, JD, Hon. DSc; CEO and President of The Ottawa Hospital (Canada), Jack Kitts, MD; former CEO of Mayo Clinic (Florida), William C. Rupp, MD; and President, CEO, and Director of Greater Baltimore Medical Center, John B. Chessare, MD, MPH, FACHE.

PART II

The Mechanics of Flow

Chapters 5 and 6. Optimizing patient flow is a very challenging task that requires management, data analysis, and clinical expertise. Chapters 5 and 6 provide a step-by-step course of actions necessary for “smoothing” surgical and medical patient flow. These chapters were written by Julia L. Krol, RN, BSN, MBA, and Michael C. Long, MD, both of whom have many years of clinical and consulting experience in streamlining hospital patient flow in different settings. Chapter 5 focuses on the theory of variability in health care, while Chapter 6 outlines three specific projects that can be used to reduce and manage variability in the hospital setting.

Chapter 7. This chapter, written by operations researchers Cheri Ward, MPH, DPT, and Kristy Zhou, BSc, BComm, MM in Operations Research, provides practical applications of IHO’s Variability Methodology® described in

Chapters 5 and 6 as well as the metrics for patient flow assessment. Variability Methodology is a scientific, practically proven approach to reducing and eliminating man-made artificial swings in patient demand and to cohorting patients in order to improve effectiveness and efficiency of their care. Ward and Zhou provide guidance on how to conduct a quantitative analysis of patient flow, how to evaluate fundamental patient flow management strategies using operation management techniques, and how to apply these strategies and techniques in the context of Variability Methodology. They also give detailed instructions on patient flow assessment, performance metrics, and other technical tools, such as queueing theory and simulation, which are helpful in implementing the concepts described in chapters 5–7.

PART III

How We Did It: The Case Studies

Chapter 8. It is well-known that an overcrowded emergency department (ED) is symptomatic of hospital overcrowding and obstructed patient flow, two disturbing events that usually take place at the same time. These two indicators of poor management endanger patients, demoralize staff, and reduce hospital revenue. Four authors of this chapter, Peter Viccellio, MD, FACEP; Katherine Ardan Hochman, MD, FHM; Peter P. Semczuk, DDS, MPH; and Carolyn Santora, MS, RN, NEA-BC, CSHA, CPHQ, are national leaders in implementing full capacity protocol, as well as early and weekend hospital discharges. The authors have implemented their ideas very successfully at their institutions and have described the solutions in this chapter. These interventions have both national and international applications.

Chapter 9. Optimizing patient flow at one hospital is challenging. Doing so simultaneously at several hospitals is even more difficult. Can it be done? In this chapter, Mary A. Ditri, DHA, MA, CHCC, and her colleagues describe their success with 14 hospitals under the leadership of the New Jersey Hospital Association in a CMS-sponsored program, Partnership for Patients. Their

success is a valuable lesson for other state hospital associations, hospital networks, and countries intent on undertaking a systemwide change at multiple hospitals at once.

Chapter 10. The most valued hospital resources are monitored beds, intensive care unit (ICU) beds, and telemetry beds. Proper utilization of these beds is extremely important for any hospital, and a lack of these beds is a frequent cause of ED overcrowding. In this chapter, Robert G. Lahita, MD, PhD, FACP, MACR, FRCP, and Jennifer Crist-Muñoz, APN-C, describe how their hospital optimized the use of telemetry beds, thereby improving patient safety, saving more than \$10 million annually, and significantly reducing average length of stay and ED boarding time for telemetry beds.

Chapter 11. Are the solutions described in the Chapters 5–7 applicable beyond the United States? The answer is a confident “yes” from Daniel J. Beckett, FRCP, MBChB (Hons), MSc, BSc (Hons), and his colleagues. Chapter 11 describes their very successful experience in applying these methods through the National Health Service (NHS) Scotland at the Forth Valley Royal Hospital. They achieved real results in better access to care and bed availability—in part, through earlier median discharge times, a reduction in length of stay of up to 20.3%, and potential annualized savings of > 3,000 bed days.

PART IV

Patient Flow Beyond the Hospital Setting

Chapter 12. One of the main obstacles to smoothing patient flow is a hospital’s inability to discharge its patients to a post-acute care facility (for example, rehabilitation or skilled nursing). Thus, the hospital’s outgoing patient flow is obstructed. This is a major problem both domestically and internationally as it hampers a hospital’s capacity to provide adequate, timely, and high-quality patient care. In this chapter, Alan Forster, MD, MSc, and his colleagues in Ontario, Canada, provide a comprehensive analysis of the problem, the effects on hospital performance, obstacles to addressing this challenge, and the solutions for managing these issues.

Chapter 13. This chapter discusses patient flow beyond the confines of the hospital setting. As many of us already know, patient care does not end at the acute or even sub-acute facility. An optimal health care system extends to social care services as well. Social care service is a provision of social work, personal care, protection, or social support services for children or adults in need or at risk. It also pertains to adults with needs arising from illness, disability, old age, or poverty. In this chapter, David Fillingham, MA (Cantab.), MBA, CBE, and Bryan Jones, PhD, and their colleague discuss the whole system flow concept, approaches, and related policies interspersed with case highlights and real world applications in the UK NHS.

Of course, this book cannot include all possible scenarios and challenges in managing patient flow in your organization.

However, this book, along with *Managing Patient Flow*, Second Edition, will educate you to successfully implement a patient flow redesign at your institution. The concepts and tools in both books were tested and successfully applied not only in hospitals but also in outpatient settings, testing laboratories, and other nonhospital settings.

I hope you, the reader, find this book helpful and important in your efforts to optimize patient flow. I have no doubt that your patients will greatly benefit from improved quality of care and patient safety, and your institutions will benefit from significantly improved margins. I also hope that you enjoy reading it as much as all of us enjoyed putting it together. That would be the best reward for all of us who contributed to this book.

Prologue

Lewis Blackman: Lessons Learned from a Ninth Grader

by Ellis “Mac” Knight, MD, MBA, FACP, FACHE, FHM

Senior Vice President and Chief Medical Officer, The Coker Group

Dr. Knight and Dr. Litvak wish to gratefully acknowledge the contributions of Helen Haskell, MA, Lewis Blackman’s mother, to this prologue.

I came home from work one November day several years ago to find my identical twin daughters in tears. One of their ninth-grade classmates—Lewis Blackman—had just died unexpectedly after undergoing routine surgery at the Medical University of South Carolina in Charleston. Little did I realize then that, while his name was unfamiliar to me at the time, the medical community in South Carolina, where I used to live and work, would forever remember Lewis Blackman from that day onward. As I sat and consoled my daughters that afternoon, I also had no idea of how far-reaching the events surrounding his death would become.¹

Just over two months earlier, Lewis had transferred, with a generous merit scholarship, to the private school my daughters had attended since kindergarten. An exuberant and outgoing boy, he fit easily into the small, close-knit student body and had made many friends in the short time he had been there.

Lewis was something of a star, even at the age of 15. He was a veteran actor who had worked from an early age in television and community theater, including the South Carolina Shakespeare Company. An academic high achiever, he garnered state honors in math, English, and science. He played the saxophone, read widely in history and anthropology, and wrote for the youth section of the local newspaper. He was an avid soccer player, planning to go out for the varsity team in the spring. Among his

friends, Lewis was known for a trenchant but understated sense of humor, and to a smaller circle, for his sensitivity to the vulnerabilities of others. The week before he died, a new boy had entered the school. Lewis had reached out to pull him into the circle of friends he himself had so recently joined. A week later Lewis disappeared and did not return, but the new student never forgot the kindness of his first friend at school.

The route by which Lewis had ended up in the hospital that fateful November day was not a straightforward one. He had been born with a condition known as pectus excavatum, in which the front of the chest curves inward, causing potentially embarrassing disfigurement. Lewis’s pectus condition had little effect on his life and in fact had scarcely been visible for most of his childhood. But when he hit puberty the indentation had begun to deepen and by the age of 14 was definitely noticeable.

Lewis’s parents had seen an article in their local paper featuring a safe, new, minimally invasive surgical procedure to repair pectus excavatum. They asked their pediatrician to recommend a pediatric surgeon and, after some deliberation, decided to go ahead with the surgery. Hopes of a summer surgery were dashed, however, by months of delays in the insurance approval process. Eventually, the pediatric surgery department proposed the date of Monday, October 30. Lewis’s mother asked to postpone the operation so that Lewis and his sister could celebrate Halloween with their friends. The pediatric surgery department agreed, and Lewis’s surgery was moved to Thursday, November 2.

Thus it came about that Lewis entered the hospital and underwent minimally invasive pectus surgery early on a Thursday morning in the first week of the month, just as the surgery interns began their new rotations. The residents who cared for him were general surgery residents with little prior background in pediatrics, while many of the nurses were recent nursing school graduates who, their supervisors said, often had a preference for the pediatric units.

After the operation, Lewis's surgeon told his parents that the surgery had gone well. In the recovery room, Lewis seemed in good spirits. Then it was realized that he was not urinating. Postanesthesia staff replaced his Foley catheter, to no avail. After several hours, Lewis was discharged from postanesthesia care, still with no urine output. Due to a high census and a lack of beds on the surgical unit, he was admitted to the pediatric oncology unit. Pectus surgery patients were not routinely placed on this unit, and the oncology staff were unfamiliar with their specialized pain regimens.

Lewis finally began to produce urine late the next day, after a nurse and pharmacist teamed up to get his intravenous fluids increased. But he continued to have unremitting nausea and his pain remained poorly controlled, in spite of high doses of opioid narcotics and regular injections of the intravenous nonsteroidal anti-inflammatory drug (NSAID) ketorolac. On Friday, the surgeon went home for the weekend, leaving Lewis in the care of an on-call attending physician. His day-to-day care was provided by weekend staff consisting of a general surgery intern and nurses from the nursing pool or floating from other departments.

Early on Sunday morning, Lewis's condition took a sudden turn for the worse with an abrupt onset of severe epigastric pain. Frantically, he said this was a new pain, quite distinct from his surgical pain, and characterized it as "5 out of 5" on the pediatric pain scale. His nurses, initially alarmed, concluded that he must have an opioid-induced ileus and recommended that he walk the halls to alleviate the pain.

As Sunday wore on, Lewis's pain did not dissipate. He grew progressively weaker and his vital signs began to deteriorate. The on-call attending had not rounded since early Saturday and the only member of Lewis's medical team present in the hospital was the intern, who

appeared tired and overextended and had few insights to offer into the situation. By late afternoon, Lewis's mother asked the nurse to call an attending physician. When a young man arrived two hours later, she assumed he was the attending she had requested. He was, however, another resident, and he reflexively confirmed the diagnosis of opioid-induced ileus. The traveling nurse who was on duty did not call the doctor again when Lewis's temperature continued to drop and his heart rate rose into the 140s during the night.

When the hospital sprang to life on Monday morning, the return to full staffing did not ameliorate the situation for Lewis because his doctors were fully occupied in the surgical suite and did not come onto the patient floors. Then the vital signs technician, rounding at 8:00 A.M., could not detect a blood pressure. In the assumption that the problem lay with the equipment, the intern and nurses spent the morning searching the hospital for different blood pressure machines and cuffs. All told, they took his blood pressure 12 times with seven different cuffs and machines without getting a reading.

At noon on Monday, while having blood tests that had been delayed from Sunday night, Lewis went into cardiac arrest and could not be revived. An autopsy the next day revealed a large perforated duodenal ulcer, a known side effect of the intravenous NSAID Lewis had been taking. In addition, the autopsy showed 2.8 liters of blood and gastric secretions in his peritoneal cavity.²

To her credit, Lewis's mother, after the loss of her son, fought to try to prevent something similar from happening to others. The Lewis Blackman Hospital Patient Safety Act now stands in South Carolina as a testament to her work in that regard.³ This statute requires that all clinical staff in South Carolina hospitals, including students and residents, wear badges that identify their names, departments, jobs, or titles. This was a response to the family's confusion over the roles of hospital personnel, in particular Lewis's mother's misidentification of the resident who examined Lewis, which she believed had stopped the family from seeking further help.

The Lewis Blackman Act also states that any time a patient or family member requests to speak to the patient's attending physician, the nurse must allow them to talk to the doctor directly, to prevent miscommunication of the family's concerns as happened in Lewis's case.

Finally, the law requires that all South Carolina hospitals have an emergency “mechanism”—an unspecified rapid response system—that families can call if they feel a patient is deteriorating without adequate clinical response. This was the first large-scale effort in the United States to create a patient-activated emergency response system in hospitals, a concept that gained widespread currency after The Joint Commission’s 2009 National Patient Safety Goal stating that emergency response systems should be available to staff, patients and families.^{3,4}

I want to make it clear that I think it was quite understandable and even commendable for Lewis’s mother and her legislative sponsors to work tirelessly to pass the Lewis Blackman Patient Safety Act. There were other factors involved in the death of Lewis Blackman, however. It is my contention that the authors of this statute should have further directed their attention toward the single most important underlying cause of this tragedy: variability in patient flow.

Variability in patient flow through modern hospitals is a very dangerous matter.⁵ Variability is manifest in the waves of patient admissions that flood into hospitals on certain days of the week. These peaks in patient demand overwhelm the ability of caregivers of all types to provide care safely to these frequently very ill people. The reason this flow is variable emanates from the way that work happens in most hospitals where providers, particularly surgeons, do their cases in the first part of the week, thereby overcrowding hospitals in the second part. (Note: Lewis’s case was on a Thursday morning.)

Hospitals also tend to function in much less than full-service mode over the weekend. Elective surgeries are not scheduled on Saturdays or Sundays. Case schedules are shorter on Fridays and Mondays. On-call personnel or residents make patient rounds on the weekends, and nursing and other clinical staff levels (such as ancillary services) drop significantly by the end of the week. (Note: Lewis’s surgeon left for the weekend, and Lewis was left in the care of a team of residents and an on-call surgeon.)

Most hospitals rely on surgical procedures to generate much-needed profits. Thus, when beds on the postsurgical units are fully occupied, rather than canceling surgeries, patients are diverted to other inpatient care units with

open beds and perhaps less knowledgeable or inexperienced staff. (Note: Lewis was admitted to the cancer unit as opposed to the surgery unit.)

The dangers of peaks in flow are well-documented in the medical literature.^{6,7} Hospitalists, who care for patients only in the inpatient setting, when surveyed for a Johns Hopkins patient safety study, reported that they were routinely put into situations where having to care for large numbers of patients significantly increased their risks of making errors and doing harm.⁸

If variability in patient flow is the problem, and a significant cause of that variability comes from the admission of many elective surgical cases during the first part of the week, then why isn’t this being addressed?

There are many reasons. First, other solutions for the many problems that result from variability in patient flow are much easier to understand. For instance, a standard response to overcrowding in the emergency department (ED) is to expand capacity in the ED⁹ or to hire more staff. Other frequently deployed solutions include changing the ED triage system and improving or shortening other ED processes, such as bedside registration.¹⁰ None of these solutions has been shown to be superior to the removal of what is known as access block to inpatient beds. Smoothing the admission of elective surgery patients throughout the week, however, has been shown to improve throughput, even in areas remote from the operating room such as the ED, and other patient flow–related issues such as quality of care and patient safety, as well as hospital bottom lines.¹¹

Second, other solutions are much easier and less costly to implement. It is much simpler to hire patient experience consultants, who suggest that health care systems join the “experience economy,”¹² than to try to persuade the hospital’s surgeons, upon whom the hospital depends for precious revenues, to change their operative schedules. Likewise, many hospital administrators believe that when the physicians take the weekends off, other clinical staff (including nurses, rehab staff, laboratory workers, and respiratory therapists) should staff down as well. The rationale seems to be that when there are no doctors around to operate or admit new cases, hospitals do not need to run a truly full-service operation, despite studies that have shown this practice to be quite risky.¹³

Although the effect of the Lewis Blackman Patient Safety Act has not been rigorously studied, the case of Lewis Blackman has been widely used in education both of nurses and medical professionals and has served as an inspiration in the implementation of rapid response systems.^{14–17} Nevertheless, if patient flow were rationalized, there might be fewer precipitating conditions for postoperative emergencies and less need for rapid response calls overall. I find it intolerable to think that the health care profession has failed to implement effective solutions despite the growing body of knowledge and understanding that smoothing patient flow can save lives and prevent harm. I am burdened with the knowledge that a few simple changes in Lewis's care could have saved his life and the lives of others like him, who have fallen victim to the health care system's reluctance to work on eliminating or reducing variability in patient flow.

If Lewis Blackman's surgery had been performed on a Monday morning, rather than a Thursday morning, he might be alive today.¹⁸ He might, like both of his parents, have a degree or two from Duke. With his abilities in math and science, he might even be a young physician by now. This thought is especially haunting, for knowing what I know now about his short life and his inner character, I am sure he would be unable to tolerate a system that refused to do the right thing and institute the corrective changes needed to save patient lives.

We who genuinely consider ourselves caregivers should not rest until this resistance is overcome. Otherwise, we will fall far short of honoring the real legacy of Lewis Blackman.

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