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Surgical variability, high post-surgical complication rates of 10-15%, and time and information lost during the transition of patients from one care setting to another contribute to increased risk and inefficiencies.

Medtech companies excel at innovating around surgical technologies and procedures to help hospitals meet their goals of cost-effective and efficacious care. Medical device manufacturers continually refine surgical devices to reduce procedural time and complexity, complications, and ultimately, costs and readmission rates. It’s becoming increasingly clear, however, that this siloed approach to surgery can only go so far, and that besides the surgical devices themselves, many steps along the surgical care pathway contribute to increased risk and inefficiencies.

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Co-founder and CEO Dennis Kogan says “It’s more important than ever [to create these surgical analytics] both because of the increasing number of patients undergoing surgery, and the increase in higher-risk patients who are prone to complications.” Reimbursement changes are also driving quality improvement initiatives and the need to document them, for example, Medicare’s MACRA MIPS (Medicare and CHIP Reauthorization Act Merit-Based Incentive Payment System), a performance-based payment system.

A Start-Up with an Established Customer Base

Caresyntax is not your typical medtech or health IT start-up; its founders are building a data-warehousing and machine-learning driven analytics platform on top of an established digital health company that has already installed systems for collecting and displaying various types of surgical data in more than 6,000 operating rooms worldwide.

Kogan, who graduated from Carnegie Mellon, and fellow co-founder Björn von Siemens, whose undergraduate degree is from the London School of Economics, met at Harvard Business School. They subsequently co-founded the healthcare investment firm Surgical Intelligence Holding, majority...
backed by the founders, with additional investment from a group of high networth entrepreneurs, and US and European family offices. Surgical Intelligence Holding has a mission of investing in “data intelligence use cases in the $1 trillion surgical industry,” according to the founders. (Both founders have in-born interests in healthcare, notes Kogan, whose father is a third-generation surgeon, following in the footsteps of his father and grandfather. Von Siemens hails from a family of healthcare and industrial innovators.)

In 2013 with funding from Surgical Intelligence Holding, Kogan and von Siemens took a majority equity position in Berlin-based S-CAPE GmbH, which focused on medical device integration for the surgery department. They engineered a repositioning of the company to create the new surgical analytics, automation, and AI company, caresyntax, with headquarters in Boston. Says Kogan “We have combined venture-type innovation with a successful company that already had a customer base.”

A Holistic Approach to Surgery

Founded in 1991, S-CAPE introduced a device for the OR called Multiconsole, a workflow hub for physicians and nurses that could aggregate and display information from many medical devices used in the OR as well as hospital IT systems (EMRs and PACS).

Multiconsole, which was developed for the specific requirements of the OR (for example, it can be completely disinfected in a sterile environment and it can interface with medical devices from any manufacturer), was the starting point for PRIME365 from caresyntax, a medical device integration and workflow optimization software platform.

According to Kogan, PRIME365 uses an internet-of-things architecture to create a network of intelligent medical devices and other inputs that can pass around and capture information, and which can also automate workflow by acting on the basis of data triggers, structured into rules by the software engine. “Here, we integrate medical devices and embed the clinical workflow with tools to support clinicians in terms of heightened efficiency, ergonomics, user-friendliness, Factory 4.0, etc. Think of the Multiconsole as just one of many hardware components that we could integrate around,” says Kogan.

On top of this surgical platform, caresyntax is building data analytics to help hospitals solve particular problems—such as high infection rates, time and information lost during patient transfers or other steps in the workflow, and the documentation of metrics related to risk and quality management.

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“To provide a truly well-embedded solution requires a deeper understanding of the surgical workflow at the point-of-care. That’s what access to rich surgical data provides us, and in this way, we build solutions with clinical concerns in mind: usability, designed for clinicians, with a focus on decision support,” Kogan says. This is in contrast to EMR (electronic medical record) systems, which were essentially designed as billing systems.

Most perioperative data is either unstructured or unstructured. That was the first problem that the founders of caresyntax set out to solve with PRIME365, which, evolving from the original S-CAPE hardware platform, is an end-to-end, vendor neutral, medical device integration platform that unifies key surgical content, including video, audio, patient vital signs, procedural timestamps, and safety checklists, among other types of data. “The key differentiator here,” says Kogan, “is that the scope and fidelity of data is greater because of our access to unstructured surgical data from inside the OR. It’s also mostly automated in terms of collection, unlike the EMR, which requires manual entry.”

Caresyntax launched qvident, its newest product, in September 2017. Qvident is a data warehousing platform with a set of built-in applications for the improvement of surgical risk and quality management. It enables
users to reconstruct surgical events and episodes using real-time surgical data (information that was not previously available to hospitals for risk mitigation or root cause analysis); and the system can overlay data on real-time process steps or milestones so users can annotate areas for improvement and analyze surgical and enterprise-level performance.

Surgery is such an acute specialty, Kogan notes, that surgical technology has historically been dominated by fairly siloed medical device companies, which have focused on specific clinical innovation, and the physical workflow that makes things easier and more comfortable for surgeons. But the founders of CareSyntax, who describe themselves as “technology entrepreneurs with some healthcare experience,” take a broader view. Notes Kogan, “We are cognizant of the full complexity of surgical processes, including workflow ergonomics and surgeon comfort, but also recognize the untapped benefits of leveraging the data beneath that. That’s the whole reason to focus on the data from the perioperative cycle, and especially the operating room as the key node of the clinical intervention that affects the whole machine of quality improvement.”

Thus, the company is not only focused on the surgeon, but also on the nurse, the CMIO (chief medical information officer), and the management. “We don’t just look at how a surgeon uses an endoscope—a crucial part of the puzzle, but still only one part—but also all other aspects, including the transition to and from the OR. We look at the data that comes out of medical devices not only as a way to automate the usage of these but as a source of information that allows you to identify and reduce surgical risk, and enables productivity and quality,” Kogan says.

He emphasizes that he is talking about new kinds of efficiencies that go beyond saving, say, minutes of OR time. “We can do that, but the concepts that we are talking about, and the pain points that we can address with automation and data analytics, are related to parameters much more focused on outcomes.” One such example is risk stratification, which can be accomplished by using device information to populate risk calculators that give a score inside the OR as the patient is transitioning to the ICU. “The point is not time-savings, per se, but on being able to use information that was previously not captured to bring transparency and predict or diagnose a potential complication or outcome,” says Kogan.

InBound Interest

With the launch of qvident in September 2017, the company raised an additional $20 million financing round led by Norgine Ventures (which contributed $11.9 million) and Surgical Intelligence Holding, to establish its first full-time headquarters in Boston and a team of US-based employees, including “high profile sales people in the space,” says Kogan. Most of the 1600 established customers of caresyntax (accounting for 6,000 ORs) are outside the US. While caresyntax can leverage those existing relationships to pull through new products as a source of recurring sales, the focus for 2018 is penetration of the US, “the newest, and most exciting market for the company,” Kogan says, since the company’s platform is well aligned with prevailing healthcare trends in the US. “It’s also a kind of homecoming for us, since the seeds for the company were sown in Boston,” he adds.

In addition to its existing relationships, caresyntax sees “a lot of inbound interest as well,” Kogan says, as hospitals and third parties focus on improving efficiencies and meeting quality performance goals. The business model of caresyntax revolves around a combination of hardware sales, subscription fees under the SaaS model, and consulting fees.

Complications go hand-in-hand with complex surgeries, Kogan notes, and one prominent academic neurotologist (performing highly skilled inner-ear surgeries) is applying caresyntax tools to the
The important role of checklists has resonated across surgical disciplines and even into the broader public consciousness. Prominent and well-published surgeon Atul Gawande (who practices general and endocrine surgery at Brigham and Women’s Hospital in Boston) has written much on the ability of even simple checklists to improve safety and outcomes in surgery. He has described an “Apgar Score for Surgery” (referring to the scoring system for assessing the condition of newborns), a numeric assessment using real-time device data to grade how things went during and after surgery. Gawande’s study (“A Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population,” New England Journal of Medicine, January 29, 2009) found that the use of surgical checklists across a patient population of almost 4,000 patients resulted in a drop in surgical complications from 11% to 7%; a reduction of the in-hospital death rate from 1.5% to 0.8%, and an overall dramatic decline in the rates of surgical site infections and readmissions.

Caresyntax has the point-of-care platform to help practitioners and their hospitals implement just these types of checklists and care algorithms by automating data collection and the unification of data from diverse sources. “We don’t have to invent new care algorithms. These things exist already,” says Kogan, “although they’re not uniformly applied at the point of care.” For now, the company has a powerful platform to help hospitals solve particular problems. Meanwhile, it is collecting the bodies of data to fuel future machine-learning algorithms and predictive analytics for the further improvement of surgical processes and outcomes.

An “Apgar” Score for Surgery

On an academic level at least, much research is going into ways to address surgical inefficiencies, variability, and complications. The BBC has widely reported on a study by the UK regulatory body NHS Improvement suggesting that operating rooms in the UK lose two hours a day due to avoidable factors. At this year’s JP Morgan Healthcare Conference, Intuitive Surgical pointed to a study on the consequences of surgical variability in bariatric surgery, which found that the bottom quartile of surgical skill correlated with a three-fold greater rate of complications and twice as many hospital readmissions (see Figure 2). “The point of the study [which was led by surgeon John D. Birkmeyer, MD, who happens to be an advisor to caresyntax] was not to point a finger at surgeons or blame them for a lack of skillful application of surgical techniques,” says Kogan, but rather, he says, to demonstrate that video-based assessment of surgical events could yield extremely beneficial insights aimed at lowering surgical risk, both clinically and financially. “Our platform is a tool with which in-depth episodic assessments, using real surgical cases rather than simulations, could be carried out, and the potential for improvement is massive.”

Kogan describes one prominent study in which, by using a combination of checklists to ensure that anti-infection protocols were followed and real-time data and predictive analytics, one hospital succeeded in achieving a 74% reduction in surgical site infections. (That study, “Real-Time Data, Predictive Analytics Can Reduce Infections,” which was presented at the 2016 HIMSS meeting, was led by John Cromwell, MD, Associate Chief Medical Officer, Director of Surgical Quality and Safety, Director of the Division of Gastrointestinal, Surgery, and a faculty member in the Interdisciplinary Graduate Program in Informatics at the University of Iowa.)