



# Value-based Healthcare: Executing On The Vision



## **Foreword: What Have We Learnt on the Journey to Value-Based Healthcare, and What Can It Teach Us for Optimized Patient Care in The Future?**

On the value-based healthcare journey there has been one constant and universal truth that was fundamental from the outset, *'healthcare driven by value puts patients, their experience and health outcomes at the heart of decision making'*. Only with value at the forefront can healthcare be provided with the greatest possible benefit for patients, the healthcare system and society.

At Johnson & Johnson Medical Devices Companies we acknowledge that value is uniquely personal for everyone. Value for a patient may lie in clinical results, swift recovery, gaining reassurance immediately after a complicated procedure, or in an easy to understand and empowering 'route map' from diagnosis to recovery.

Likewise, value goals can be different between countries, hospitals, and clinicians. Value may lie in the latest MedTech innovations for efficient, high-quality, and cost-effective care delivery, such as access to process digitalization that improves surgical predictability with reduced likelihood of human error. Or value could be access to education that delivers advanced knowledge and skills with a minimized amount of time away from patients.

As a partner to healthcare providers, we understand that we have a critical role to play in empowering health systems to channel resources optimally into healthcare. We are committed to do this through the added value our devices and technologies offer, and through our value-based services and educational solutions.

It is critical to take stock and apply what we have learnt in recent years in this industry-wide paradigm shift. Not only will this enhance our deep and ever-expanding understanding of value-based healthcare, but also optimize how we apply technology, behavior science, care-centered design thinking and consumer insights to change the trajectory of human health for the better.

### **Claudia Herben**

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# Why COVID-19 Makes Value-based Healthcare More Critical Than Ever?



**H**ealthcare should put patients at the heart of decision-making, while delivering benefits for society as efficiently as possible. This, I believe, was clear before the pandemic.

However, the additional strain under which our systems must operate at present, as well as additional demands for resources, make the case for value-based healthcare (VBHC) stronger than ever before.

Even before COVID-19 dominated our thoughts and global news headlines, the **World Health Organization** (WHO) estimated that between 20% and 40% of all global health spending is currently wasted through inefficiency. Clinicians and health systems are under intense pressure to improve health outcomes, increase patient satisfaction, and improve HCP satisfaction while reducing costs with often outdated, over-stretched and under-financed delivery structures.

Couple this with the ongoing COVID-19 pandemic and it's clear to see the challenges faced when striving to create high-quality and sustainable healthcare across Europe. To me, the time has come to embrace VBHC.

Measuring clinician- and patient-reported outcomes, integrating these data into the process of care and devising new procurement models can help us to better coordinate the patient journey.

Every hospital within every health system in every country is unique, yet the goal should always be to achieve the best possible outcome for each patient. I don't believe that off-the-shelf solutions will work universally. It is vital that healthcare providers identify the biggest challenges and then team up with hospital administrative leadership and others (health authorities, healthcare companies, insurers etc.) to co-create bespoke solutions that fit their needs.



**Christophe Duhayer, Managing Director,  
Johnson & Johnson Medical Devices, France**

Combined with outcome measurement, resource allocation collection shows where unnecessary waste can be prevented. Technologies can help by tracking and streamlining supply chains, and by integrating clinical best practice. This can reduce high treatment costs that could arise later.

### **Data And Insights**

I believe an insight-driven approach helps health systems identify and optimize the most cost-effective care delivery, so patients receive the right care, first time, every time. To gain this insight we need to measure solutions systematically, track

associated health outcomes and channel feedback into quality improvements.

Information from patient-reported outcomes measures (PROMS) is particularly insightful. PROMS express the voice of patients who evaluate, for instance, the impact of a surgery on their quality of life. This can lead to changes in the way services or care are delivered to ensure people are getting the most from their treatment.

As we adapt to delivering care during a pandemic, and look beyond it to a post-COVID world, I see value-based incentives and rewards for providers that deliver value becoming a feature of healthcare. Value-based procurement is a major part of this. We are witnessing a shift in which value is replacing price as the primary decision-making factor in tendering. This approach elevates products and solutions that positively impact patient-focused outcomes to save costs in the long term and ensure optimal value for health systems and society.

Ultimately, value lies in healthcare professionals taking account of patients' perspectives when delivering care. This offers patients the smoothest possible journey back to good health and quality of life. Our role as a healthcare industry is to understand the unique needs of individuals and then apply our broad-based expertise – technology, behavior science, care-centered design thinking and consumer insights – to change human health for the better. COVID-19 has put unwelcome strain on our systems, but may become a catalyst for the changes we need.

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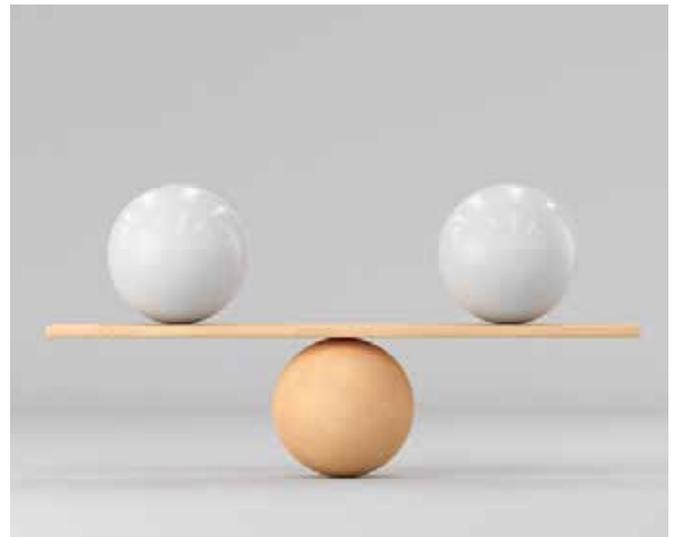
# Connected Strategies Are Vital For Medtechs In The Consumer-Led 2020s

ASHLEY YEO

**D**iscussions on the shape of health care have moved from “reimagining” to the next stage: building and executing on the vision. That is the thrust of EY’s *NextWave Report: New Horizons 2019*. Additionally, for medtechs seeking business continuum, “duality” is now a preoccupying thought.

- Health systems and organizations intent on meeting the challenge of making themselves future-ready will do so only by embracing digital transformation and optimizing performance through agile business transformation. This may require deep-seated cultural change in which they must build, buy or partner for solutions that bring them to their goal.
- Open IT infrastructures are needed for the connected health ecosystems of the future as we continue to move towards a “participatory health world” in which a permissions-based, frictionless flow of health data and information is a vital ingredient.
- For medtech companies, long-term values will be derived not necessarily from owning data, but from new relationships and having access to data pools that allow algorithms and insights to be created. But while they map the future, they must also service ongoing stakeholder demands in what EY calls a duality approach.

The future of health lies with technology. Within the health care industries, investors have been among the first to act on this realization, funding health tech, practice management and home health care ever more concertedly over the past decade. In 2014, private equity deals in health care accounted for 8% of overall investment volumes; in 2018, that had grown to 12%. So says EY in its most recent *EY NextWave Report: New Horizons 2019*.



This series of EY reports tracks past changes and maps the future of health care, and gives views on how and how fast health care delivery is changing. It also illustrates how stakeholders must adapt – including those who are leading the changes. The latest report underscores the slow pace of uptake of digital technologies in health care, and presents the widely held general view that health care is less innovative than other economic sectors.

But it also identifies the growing attraction of health care for investors, pointing out that one in seven private equity firms made health investments in 2018, chiefly in regulatory compliance and clinical efficiency. The theme of PE is covered is one of the report’s four sections (or “articles”). It will be the focus of a separate *In Vivo* article.

## Connections Make The Health Care World Go Round

Noteworthy is that the “connections” theme dominates EY’s report in its other three sections devoted to: consumer and physician expectations of a digitally enabled, connected health ecosystem; the path from fee-for-service to a future centered on value; and the transition to a consumer-centric,



participatory, outcomes-based and cost-efficient health and well-being sector. Clinical care – while always remaining front and center – is becoming a smaller contributor in an individual's health, viewed holistically, the EY authors observe.

The technologies that underpin a connected, wellness-oriented, anytime-anywhere health ecosystem are already available, says Jim Welch, EY global medtech leader. Innovation is arriving fast, but for medtechs intent on serving the evolving medtech market, which was valued at around \$400bn globally in 2018, there is an additional challenge.

Funding has continued to come into the medtech space, via PE, venture capital and M&A and commercial deals, Welch told *In Vivo*. "But one of the challenges from an innovation standpoint is that there is a duality concept going on, which, for the industry, means that medtech also has a responsibility to service and innovate around the products that are already in the market," he said.

Companies will often have huge volumes of devices on the market that they need to continue iterating on, to have smaller footprints, better batteries, smarter features, and different levels of sensors, etc. But alongside, they are aware of the need for disruptive therapies, new treatments and technologies, including robotics. Historically, device innovation has required significant amounts of capital and resources, but now the sector has entered the era of data-driven connected devices, where those resources are just as likely to be data scientists as engineers. "It's an expanding innovation landscape, and requires a change in skills for a patient base that is not fixed."

But it still requires decisions on capital allocation and R&D investment, and on likely returns to shareholders and navigating the channels of reimbursement. And this comes at a time when companies are not making the same margins as they previously secured in the overall ecosystem. They are also alert, to the risk of being disrupted by a tech company coming into the market that looks at the environment in a completely different way.

### Where To Invest?

Having taken these dynamics into consideration, Welch said a lot of choices were emerging around

investment areas in the new AI and data-driven medtech ecosystem.

The larger medtechs usually have a formal technology scouting department, including functions from corporate development and R&D groups that are solely externally focused. Historically, these companies drove their innovation from internal resources and strengths. Now, they are additionally doing this in conjunction with providers, with whom their relationships are now extending, to center on which technologies to evaluate.

The need for such unique partnerships is clear, but they are now revolving more and more around data science. Companies are thus engaging in technology outreach in a more organized fashion, and will task individuals solely with a brief of scouting for AI and data-driven technologies, which may even be a challenge to their expertise and understanding. "Given the pervasiveness of technology, there's a lot to look at, but how companies filter that in a logical way remains a challenge," said Welch

**"How do we, as partners in the ecosystem today, remain viable tomorrow? That's the world our clients are living in." – Jim Welch**

### Duality

Companies' behaviors are increasingly driven by the issue of the duality of growth – the need to invest and bring in technologies while keeping established business ticking in the near term. "A balance is required, and it has been a challenge," said Welch.

Welch went further: "Fundamentally, if you boil it down to a simple concept, the need is for duality. How do we, as partners in the ecosystem today, remain viable tomorrow, as the industry continues to disrupt itself both from a technology and commercial standpoint? That's the world our clients are living in today," he said.

Save for a few extremely innovative health care systems in smaller countries that are making big strides perhaps from a low base, the same challenges, more or less, are being faced globally.



Health systems are dealing with non-traditional medtech companies arriving in the medtech space, bringing technologies such as FDA-approved algorithms and AI that are considered to be medical technology, although historically they had nothing to do with device-based engineering.

“We’re also starting to see their ability to leverage consumer and other applications of consumer tech and connect with health care providers to suggest how their technology could be part of a medical technology offering,” Welch said.

There is an embedded fear of the power of the tech firms, both from a capital and a knowledge-of-the-consumer standpoint. Medtech companies are however starting to embrace and accept that, and work together with tech companies in this era where the consumer has growing power.

Job roles in traditional medtech and care delivery are now prone to change. Excluding implantables, the people who use medtech, and the place where it is controlled from a medtech standpoint are changing: the deliverer is increasingly the caregiver rather than the clinician. Care is being delivered outside the traditional care setting. “Medtech is now more user friendly to a wider population, and that’s where tech companies from design and innovation standpoints have real strengths,” Welch noted.

The devices themselves are becoming part of an “ecosystem of sensors,” creating data that are used to drive clinical decisions and outcomes. Profoundly different ways of approaching the delivery of health and care are underway, and physicians, more so than consumers, are anticipating the arrival of these new and non-traditional players into the health industry, says EY’s *NextWave Report*. New care models are already in play, for example, the Mercy Virtual Care Center and Intermountain Health’s Connect Care Pro.

### **Funding Of The “New” Industries**

A lot of funding is going into diagnostics at present, thanks to the ongoing debate around personalized medicines. In fact, digital health, genomics and early diagnosis – which are also the three “new” industries that the UK, for instance, is striving to create under

its Life Sciences Industrial Strategy – are attracting a lot of investment globally in early-stage venture rounds. This is in some ways a validation of the next wave of devices – the transformative technologies – that need investment to bring them to market.

The fact that company valuations in medtech have remained very high has served to restrict the number of acquisition targets of market-ready companies and products. Valuations will continue to rise, barring any unforeseen macro-economic adjustment of the type last seen some 10 years ago. But this, in turn, provides an even greater incentive for investors to look elsewhere.

And similarly, deal-making will go on, with the larger organizations continuing to see value in divesting some parts of their portfolio. There is still scope for a lot of tuck-ins. Welch added: “We think the environment will continue to be positive from a deal-making perspective for the next few years.”

### **US Leads The Way In Value-Based Adoption**

In all this, for companies addressing the global market, succeeding in the US with its big market and high spending on health care is a vital step. Complex and difficult to operate in it may be, but “getting things right in the US is incredibly important from a commercial viability standpoint,” said Welch. The US is still the dominant market in global medtech terms, and VC flows come mostly from the US.

Recent information points to some 35% of the US health care spend coming through newer payment models – the outcomes and value-based models. Adapting to these new payment models will be important for medtech companies in the future. The value-based model is scaling up, slowly but surely. “It will certainly be part of the landscape and of how companies need to look at reimbursement for the foreseeable future,” said Welch.

In the VBHC arena, companies’ views of their role are changing. For them, it was initially a question of “How does my technology/product change in a value-based model?” Now that the fundamental VBHC arrangement tends to include multiple devices and interventions, and activity around the patient, it is a question of: “How does my device fit into an overall outcome as part of a holistic answer?”



It is more straightforward in some areas than in others. For instance, in orthopedics, how a device fits into the overall puzzle is fairly clear. In the acute scenario, however, it is not so obvious, Welch said. But that should not detract from the overall significance of value-based approaches. Big strides in understanding have been made. “We’ve got to a place where we know how value-based fits well and where it makes sense,” said Welch. But patience is still needed, he added, as hospitals and payers must figure out where they fit into the overall scheme of things, while the likes of Abbott Laboratories, Johnson & Johnson and Medtronic will pull the industry along.

### **Maturity Of The Mission-Based Medtech Company**

Disruption to markets and business planning is not what companies in a mature industry serving an often fragmented market want. But for Welch, with the experience of a several industry cycles behind him, including time at Abbott Diagnostics, this is the nature of running global businesses. “We might need to react, and pivot, but the industry continues to be really healthy and growing, and that allows it to absorb the changes.”

Medtechs, he said, had a focus on mission. “That’s why we’re here as an industry, and why the industry keeps moving forward,” he said. “We’re hyper-focused on consumer- and patient-outcomes; as long as we stay that way, we will make our way through, one way or another,” he added, referring to the challenges ahead, as described in EY’s *NextWave Report: New Horizons 2019*.

### **Digital Health Systems**

Future health care systems will be smart, with a basic remit of delivering operational efficiency and clinical excellence in a patient-centric model. It will be a 5G based-system focused on providing value. The EY report defines value as: “providing better care for patients and better health for populations at a lower cost in a manner that prevents provider burnout.”

Algorithms (analytics, machine learning and other AI technologies) and robotic process automation (RPA) will be able to make waves of user-generated and clinical data manageable and targeted.

## **Digital Challenge In Focus**

EY’s recently issued *New Horizons 2019* edition, part of its *NextWave Health* report series, addresses what will be needed for the industry to transition from reimagining the health care delivery ecosystem of the future to making it a reality.

It draws conclusions and insights from a survey of over 9,000 subjects, including 650 physicians, from four countries. One clear finding was that, the core business of “health care” is expected to be based in digitally enabled models of care, including virtual delivery and interactive person-centered tools.

The digital challenge is the theme of one of four “articles” in the report, which also delve into value, private equity, and the future shape of health care.

Changes in culture will be called for: health organizations will need to become more agile and look to build, buy or partner for solutions that bring their organizations up to speed; and remote monitoring and AI technologies – to become central health care provision concepts within the next 10 years – will need to be factored in to enable the management of chronic and complex diseases by remote teams to care for people at home.

It will be a world where:

- virtual consultations are selectively used in areas where they have been shown to have been as effective as in-person consultations in such diverse areas as diabetes, chronic obstructive pulmonary disease (COPD), chronic pain, post-surgical support and caring for the elderly;
- robots are used for prescription dispensing, sanitation and disinfection, and transporting equipment and supplies, as well as in certain surgical procedures and medical education;
- practice variations and waste are eliminated; and asset performance, supply chain and



inventory management are automated; and

- blockchain technologies will be used to guarantee the safety and integrity of biomedical and pharmaceutical products.

### Value

Developed markets will adopt more sophisticated outcomes-based models, but this will take time, says the EY report, given the entrenched culture of fee-for-service and supply-push traditions in health care. Value-based models that are worthy of attention are being pursued, for example, in:

- Sweden, using evidence-based treatment guidelines, disease registries and outcome-dependent reimbursement for specialized care;
- Canada, employing a decentralized system where the provinces are designing payment systems to move away from fee-for-service;
- Japan, which has published a forward-looking vision of health care policies through to 2035, focusing on value-based improvements; and
- the US, where provider-payer partnerships are resulting in payment models and incentives that reward high-quality outcomes and achieve savings.

EY's report also proposes that a patient-centric definition of VBHC is devised to prevent any temptation to focus narrowly on cost reduction. Indeed, the patient perspective should be uppermost in mind. As illnesses often go beyond physical well-being and involve emotional and psychological factors, aiding patients' understanding of health and medical information is vital to enable them to make informed decisions.

And supporting activities that matter to physicians, as well as patients, will improve value, keeping in mind the essential, unique drive of staff who opt for a career as a caregiver.

### Making The Transformed Health Care Vision A Reality

If a consumer-centric, participatory, outcomes-based and cost-efficient health care system is the goal, two persistent anachronisms need to be addressed: 1) much care that does not need to take place in a high-tech facility continues to occur in that very setting, adding layers of cost and presenting hurdles for other patient care; and 2) investment in tools for diagnosis and treatment far outweighs spending on prevention.

A third problem is that the basis for connected health ecosystems – open IT infrastructures that connect all stakeholders and supports the easy, permission-based flow of information – is missing.

Connected health ecosystems are an essential precursor to delivering better lifelong health, says the EY report. But they require data sets of sufficient size, quality and data variety to deliver accurate or optimal results.

For health companies, the value will not be in owning data but in the algorithms and the insights they generate that shape health outcomes in ways that matter to consumers, payers and other health stakeholders, says the EY report.

The report details a four-step process that moves from “system imagining” to “reality” that includes: setting a transformation agenda that optimizes the business of today while innovating and growing the business of tomorrow; using legacy system optimization, while transitioning to open architecture and blockchain-enabled solutions; building intelligent automation, including integrating robotics with multiple components from different emerging technologies; and instilling a risk-optimization mindset – extending to cybersecurity solutions for medical devices and wearables – and embedding “trust” into services.

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# Optimizing patient and procedure flows to treat patients more efficiently

## The cardiac arrhythmias story at the Oslo University Hospital



### About the Oslo University Hospital

Norway's largest hospital, with over 20,000 employees carrying out more than 1.2 million treatments each year. Responsible for approximately 50% of all medical and healthcare research conducted at Norwegian hospitals.

### ⚠️ What were the challenges?

The Oslo University Hospital was facing challenges in meeting increasing demands for their electrophysiology laboratories (EP lab), where catheter ablation is carried out, while maintaining the high quality of care that they deliver. The key barriers include:

- Absence of patient flow inside and outside of the EP lab
- Long waiting time (up to 6 months after referral)
- High amount of unutilized time in the EP lab (>25%)
- Complex scheduling process
- Inconsistent and long changeover times
- High patient drop-out rate (10%)
- High variation in inter-procedure times
- Lack of standardized procedures for referrals and follow-ups
- Lack of pre-procedure medical assessments and patient education

### 🎯 What were our objectives?

- 1 Optimize EP lab utilization
- 2 Increase the total number of ablations carried out with a focus on atrial fibrillation (AF) procedures

### 📈 What did we do?

- 1 Worked closely with the hospital and their multidisciplinary team to carry out a comprehensive review (known as 'Diagnostic Health Check')
- 2 Using results from the 'Diagnostic Health Check', mapped out the current patient pathway through the process of 'value stream mapping', to identify the biggest hurdles and design an ideal pathway
- 3 Using Lean management principles, redesigned the patient journey to deliver value and results
- 4 Trained all involved stakeholders on the Process Improvement (known as 'Kaizen', a long-term approach to continuous improvement), co-creating measures to remove any non-value adding activities and organize care around the patient

### 🏆 What did we achieve? From 2017 to 2018:

**↑ 24%**  
increase in number of AF cases

**↓** Reduced waiting time after referral from 6 months to 17 weeks (less than 4 months for AF cases)

**↓** Decreased patient drop-out rate from 10% to 0%

**↓** Reduced unutilized time in EP lab from 25% to 10%

**↓ 26%** reduction in total procedure time for AF ablation\*, resulting in significant decrease in nursing staff's overtime

\*including changeover time when using two different techniques, from 9 hours 21 minutes to 6 hours 56 minutes



## What is Lean management?

One of the most scientifically proven management solutions used to deliver value from the patient's perspective, eliminate waste, and improve continued overall performance.



## The road to Lean thinking



### Step 1: Correctly specify value for the Oslo University Hospital

Achieving true value for patients must become the overarching goal of healthcare delivery, with value defined as the health outcomes achieved per Kroner spent. The challenge is that, while focusing on the patient outcome, we cannot forget the non-value adding activities which consume a large portion of available budget. Together with the hospital project group, four main issues were identified:

**1 Long waiting time:**

Up to 6 months after referral



**2 Lack of pre-procedure assessment and patient education in out-patient department (OPD):**

Patients felt uninformed and 'surprised' by the procedure and/or treatment they had to go through, causing high patient fall-out rate of up to 10%



**3 Complex scheduling process due to specific disease state:**

- It takes a considerable amount of time when changing from one ablation technique to another in-between two AF procedures
- This leads to regular overtime for nursing staff and high unutilized time in the EP lab (>25%)



**4 Lack of standardized protocols in the EP lab, leading to:**

- High variation in pre-, inter- and post-procedure times
- Difficulties in collecting data and monitoring performance





## Step 2: Identify the value stream and remove the waste

We followed the patient along the journey, from hospital admission to discharge, to identify the 'ideal' pathway:

OPD	Pre- and post-procedure processes	EP lab
Nurse coordinators are appointed to carry out medical assessments and patient education ahead of procedures, so patients are fully informed and prepared.	A pre-defined management protocol is in place for referrals and follow-ups, streamlining patient flow to reduce waiting time and unutilized time, increase flexibility in scheduling, and ultimately treat more patients.	Standardized work procedures are created to reduce variability in procedure times. Data collection is also made possible, making it easier to measure current performance and future improvements.



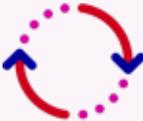
## Step 3: Make the care flow

To go from the 'current way of working' to a new pathway design, it is crucial to involve all stakeholders and to make improvements to the process at every stage:



**In the OPD**

- Appointed nurse coordinators to carry out more detailed and all-rounded pre-procedure assessments and patient education
- A pre-defined referral management protocol was put in place for referrals and follow-ups



**In the EP lab**

- Implemented the 'quick changeover' approach to improve changeover time and reduce unutilized time
- As a result, the team has been able to schedule more cases per day



**Training**

- Trained all stakeholders involved in Lean Kaizen management, so that they can work as efficiently as possible around the new procedures and protocols being implemented, achieving measurable, sustainable change





## Step 4:

## Tailored measurement for impactful results

In order to achieve continuous improvements and effective results, the focus group decided to set measurable targets with annual evaluations; the first evaluation showed positive results:

	Baseline prior to implementation (2017 data)	First evaluation – one year after implementation	Agreed long-term goal
Waiting time	6 months	17 weeks (<4 months for AF cases)	3 months
Patient drop-out rate	10%	0%	0%
Changeover time	N/A	N/A	45 minutes max.
Number of AF cases	280	347 (24% increase)	500
Unutilized time in EP lab	25%	10%	5%
CARTO* total procedure time (based on 10 observations)	4 hours 57 minutes	3 hours 45 minutes (1 hour 12 minutes time saving)	<3 hours
Total procedure time combining two AF ablation techniques	9 hours 21 minutes	6 hours 56 minutes (26% improvement)	Maintain level of improvement



“We involved the whole department in the process and, through follow-up and assessment, they can see we’ve achieved something good by making changes that improve productivity and safety.”

### Erik Kongsgård

Head of Electrophysiology,  
Oslo University Hospital

Our CareAdvantage approach helps hospitals overcome challenges by identifying customer needs and co-creating solutions to achieve the desired results.

To find out more, contact: [emeacareadvantage@its.jnj.com](mailto:emeacareadvantage@its.jnj.com)

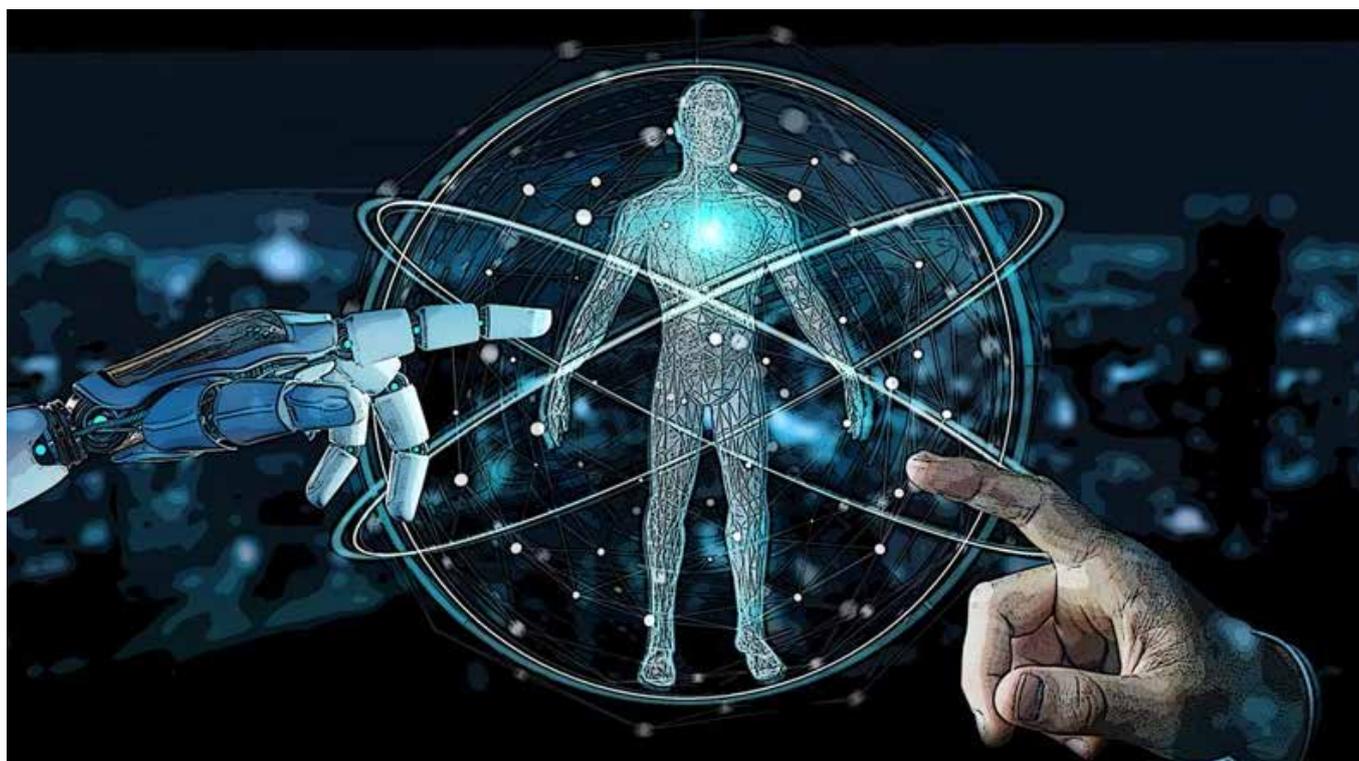


\*Important Information: Prior to use, refer to the Instructions for Use supplied with this device for indications, contraindications, side effects, warnings and precautions.



# Ortho Demand Pull: DePuy Synthes Shaping Its Digital And Robotic Surgery Strategy Around Patient Needs

ASHLEY YEO



Johnson & Johnson's DePuy Synthes orthopedic business has taken a measured view of digital and robotic capabilities, rather than acquiring assets that perhaps do not fully meet its strategic needs. For the business's global R&D head, Euan Thomson, any new technology must augment the group's abilities to drive meaningful outcomes.

- DePuy Synthes has laid the foundations for its orthopedic robotic offering, and has thoughtfully pulled the elements together to craft what it sees as the optimum package for surgeons and patients.
- Its vision puts patients in a more central role. Orthopedics is about mobility, and mobility determines lifestyle, says DePuy Synthes,

which plans to address real-world outcomes as they are viewed by patients.

- So what? The consensus is that the big players in ortho will each have a robot by the end of this year (though all will not be commercialized), but how central robotics should be to such a mature surgery is a moot point – and DePuy Synthes has its own answer to that.

Is DePuy Synthes late to the digital and robotics party? New technologies, tools and capabilities regularly emerge and become either central or peripheral to health care, and the wheels of medtech business turn regardless. That seems to be the attitude at orthopedics giant DePuy Synthes, which in recent months has identified and acted on its own considered plan to maximize value for



patients and users with a selective approach to technology integration.

Euan Thomson, PhD, global R&D head for Johnson & Johnson's DePuy Synthes business, believes that it has developed a platform for a solid digital strategy, centered around brand-based technology solutions. It draws in robotics, imaging and digital education systems, as well as products and services that interact directly with patients. Thomson spoke to *In Vivo* about the company's plans.

***In Vivo:*** In digital health care, the picture is becoming clearer and the needs better defined. While some companies set their stalls out early, others adopted a watch and wait policy. It seems DePuy Synthes is in the latter camp.

**Euan Thomson:** In an environment focused on technology solutions such as robotics, we are targeting the use of technology to drive outcomes. This includes robotics, and the company's February 2018 acquisition of Orthotaxy SAS, a privately held developer of software-enabled surgery technologies, including a differentiated robotic-assisted surgery solution, fits in here. But our vision is much broader than that. Orthopedics is a mature field, and while companies have been investing in this space for many years, there are still gaps and potential for improvement in outcomes. In back surgery, for example, we still see cases of 20–40% failure rates. Also, 20% of patients are still dissatisfied with their total knee replacements, and we know that outcomes vary among centers, both in terms of productivity and clinical outcomes: surgeons who perform greater numbers of a given surgery tend to lean towards better outcomes. Our analysis shows that what drives outcomes is more than just the technology, implants and instrumentation. So we use the need to drive outcomes as a starting point.

**Q. What drives those outcomes in the orthopedic arena, seen from DePuy Synthes' angle?**

**A.** We think there are three pools of activity that drive outcomes. The first is certainly technology, and as a company we always aim for the best possible implant quality and instrumentation.



**Euan Thomson**

Surgical techniques also make a difference. And then the patients themselves can make a difference. Patients can influence outcomes from the point of patient selection and patient preparedness, in areas such as body mass index (BMI) and lifestyle habits (smoking, alcohol consumption), which can also influence time to recovery. Our feeling is that all three pools of activity must be addressed. So taking a step back, we think that the role of robotic technology is to support the two areas that are not addressed by the implant and instrumentation technologies. Firstly, it is an attempt across the board to address human factors relating to surgical techniques. Robots are there to improve the manual dexterity of the surgeon and move towards more consistent and potentially better outcomes. And secondly, we've designed what we call Digital Surgery, for the entire continuum of care, which both includes and goes beyond robotics to monitor patients, help physicians with pre-surgery patient assessments, and guide patients through rehab. And outside the operating room, there are other technologies that can help maintain optimum standards of care during



the operative procedure, which include surgery standardization technologies like that of the SPI (Surgical Process Institute), as an example.

**Q. The purchase of SPI predated Orthotaxy. How does it fit into the plan?**

**A.** SPI provides a digital checklist that guides not just the surgeon but the whole team through surgical procedures. Surgeons who use the same OR team consistently tend to achieve better outcomes – regardless of who is on the team. By doing the right thing at the right time, they are supporting the surgeon who is thus also able to do the right thing at the right time, meaning that efficiency and clinical outcomes will be optimized. And it supports our strategic vision, which is not simply to chase the latest and brightest technologies, but rather to use technology to drive, improve and optimize outcomes.

**“Robotics are often marketed to the outside world as guaranteeing improvements in procedure quality. I’m not convinced by that.” – DePuy Synthes global head of R&D Dr. Euan Thomson**

**Q. At what point did DePuy Synthes fully adopt the outcomes and value-based approach to patient care, and what were the catalysts for that change in thinking?**

**A.** It’s been an evolution, and the ideas have been solidifying over several years, but in the past year or so we’ve really rolled up our sleeves on this. I have two roles – leading R&D for DePuy Synthes and also co-leading R&D for all of Johnson & Johnson Medical Devices, particularly in digital technologies. Our R&D organization is setting up a dedicated digital technologies team to address all areas – this is the team that is building the Orthotaxy robotics system. We also have partnerships and internal builds in place to address patient monitoring – those individuals will co-ordinate that activity within and for SPI, and for other solutions such as C-SATS, a University of Washington spin-out that uses technology to facilitate performance

reviews for surgeons, which we acquired recently. That company does a review of video gathered in the OR, for educational purposes. They segment it into stages, crowd source a review of each video segment and give feedback to the surgeon on differences in what’s observed in the videos compared with standard-of-care type videos. They have started with laparoscopy. The idea is that feedback is used by surgeons as learning as they go along. It’s part of the same digital and robotics initiative, which has all come together within the last 12 months.

**Q. Some orthopedics stakeholders view robotics as cumbersome and not fast enough, but now that DePuy Synthes’ strategy is coming together, how is Orthotaxy different?**

**A.** We took our time looking at robotics. It’s a field where it is arguably very easy to succeed – robots appeal to patients’ needs and very often, robotics are acquired on the back of a tick-box mentality. They are marketed to the outside world as guaranteeing improvement of procedure quality. I’m not convinced by that. What we were looking for in robotics was something that really would move the needle in terms of outcomes, without interrupting workflow or adding to the complexity of a procedure. We see large, cumbersome systems in the million-dollar range that have to be wheeled in the OR for each procedure, get in the surgeon’s way and very often require support from a dedicated team to enable the surgeon to operate it. We didn’t want to go in that direction. When we found the Orthotaxy system, we believe we saw a very different type of robot – a platform, rather than a system. (Also see “J&J Adds To Robotic Focus With French Firm Acquisition” - *Medtech Insight*, Feb 22, 2018.) It is a small, almost portable system that can be lifted by the surgeon, maneuvered into position and held there with a support arm. It has a navigation component, which refreshes images 300 times a second and automatically adjusts position to compensate for motions by the surgeon or the patient. The concept can be applied to different techniques: in the field of total knee replacement, the end effector is a guide system that is continually adjusting the guide block, with



the surgeon remaining in control and using the saw through the guide block. The surgeon is doing the cut, but the accuracy is being controlled by the robotic alignment assisted by the continuously updating Orthotaxy system. In spine procedures, the saw guide block would be replaced with a drill guide component – the system refreshing in the same way for, say pedicle screws, to continuously guide alignment. It's a modular concept. It doesn't get in the way of workflows. We've found it easy to use, intuitive and extremely accurate. This is what we feel is the future.

**“We believe this is a unique platform, and that when we bring it to market it will significantly disrupt the existing robotics platforms.” – Dr. Euan Thomson**

**Q. Is keeping the surgeon in control of the orthopedic procedure, rather than being led by the robotic technology, a key element of the DePuy Synthes offering?**

**A.** This is a total orthopedics platform. The difference between this and other platforms is that the technology doesn't dominate the whole procedure, so you're not doing a robotic procedure, but a procedure that includes robotics. There could be segments of any procedure – hip, shoulder, etc. – that would incorporate robotics. But the capabilities of the easy to move around, versatile and modular technology from Orthotaxy give it huge potential. One of our guiding principles is that surgeons should have their own workflow, and the robot should fit into that. We believe that procedures incorporating the Orthotaxy system will be faster than others. I don't think any other systems can make that claim. We also believe that this is a unique platform, and that when we bring it to market, it will significantly disrupt the existing robotics platforms. So our vision for implementation is that robotics is one piece of the answer. We're aiming for a 2020 “market ready” for this technology, for one or more procedures, which is pretty ambitious, but we feel achievable. By the time we get there, we want to have operating rooms ready to receive it and for other digital technologies that we already have – like SPI – to also be in place. SPI has already defined a procedure

to ensure the team uses the robotic platform in the optimum way.

**Q. What are the remaining parts of the puzzle DePuy Synthes needs to complete a holistic digital orthopedic offering in the operating room?**

**A.** We have big initiatives around patient engagement and monitoring. Patients are strong influencers on outcomes. Most of the outcome measures we use today are surgical outcome measures that the surgeons can visualize from the data presented to them. But there is a broader vision that includes the patient perception of outcome. Patients are looking for “human things” – day-to-day functions like being able to move without discomfort. These are elements that drive outcomes in their minds, not parameters such as radiographic healing. Today, the industry is only very loosely connected with that, and there is room for improvement there. Orthopedics is about mobility, and mobility determines lifestyle. We have to get inside mobility and lifestyle to understand the success or failure of a procedure from a patient's perspective. And also to think about real-world outcomes as they are viewed by patients. Our initiative to find ways of quantifying and monitoring such things is at an early stage, but we can use the existing connected digital platform, Johnson & Johnson Health Partner [currently available in the US], which taps into patients' motivations and their underlying drive to get and stay healthy as they recover from knee, hip or weight loss surgery. Or help them prepare physically, mentally and emotionally for surgery and their customized, real-time care that becomes personalized over time. This in turn helps us gather information about outcomes, and we aim to supplement it by using automated ways of assessing lifestyle and motion.

In EMEA, as part of the CareAdvantage value-based approach, the company offers the Care4Today patient pathway solution. This includes the Orthopaedic Program that provides hospitals and patients with resources to ensure consistent, coordinated care while supporting patients to take control of their own treatment and recovery.



Patients, for the most part, want to do the right thing; where we can make a difference is in acknowledging that the “right thing” tends to be personalized, rather than generic. For example, helping them to understand the fundamental importance of adhering to their post-surgery rehabilitation protocol can really make a difference in terms of outcomes.

**Q. The role as a provider of technology has changed and companies like DePuy Synthes are now offering more of a package of services.**

**A.** That’s what we’re moving towards. All the basic elements are in place today: this is no pipe dream or future vision, as we already have a continuum and are now working on enhancing that. We have Health Partner for monitoring patients [set up for the US in November 2017], Care4Today, used by the European team, and a software planning system that can calculate the optimum cutting angle for a knee replacement. We have SPI for guiding the team and organizing the workflow, to ensure efficient and effective team flow during the procedure itself, and post care monitoring. We believe Orthotaxy will be a game-changer, as we believe it is a truly different concept in that it is a modular system that integrates itself with the workflow and maintains and improves the quality of the procedure. We’re focused on orthopedics, but this digital surgery concept applies to all surgery in different ways. Outcomes and the broad-based approach is what is guiding DePuy Synthes right now. But looking forward five to 10 years, we will be integrated much more into the Internet of Things [IoT] world, and the sensing of patients’ lifestyles becomes more based on passive sensors that we use in our everyday life, as opposed to active sensors, like apps and wearables. Many household items will ultimately be a sensor of some sort, observing behaviors and piecing together information that can help build a picture of a person’s well-being, diet, work patterns, exercise routines, and, in fact, all things that have an impact on health care. That will help us understand what makes the difference in terms of outcomes, over time, and across all surgeries. In the OR, other technologies will come

to bear, even though we are not convinced that they are ready to be used for anything other than education yet. Virtual reality and augmented reality will find their way into the OR, but there are a number of steps needed before they can safely add value.

**Q. On the theme of value, can you define what value digital and robotic offerings like yours will bring to providers?**

**A.** SPI has evidence to show that its technology significantly reduces OR times and can increase the capacity of the OR, which is clearly a driver in the public and private sectors, simply by making sure that the right equipment is in the room before the procedure starts. And the OR team follows an optimized workflow. It’s a system that provides a learning tool: as the team goes through each step of the procedure, it can be analyzed to see where optimization is both possible and needed. This system sits on the same data platform as another system that monitors patients and tracks how fast each patient returns to full mobility, and there is the ability to link the two. It is the beginning of a vast data platform across all procedures, and that’s where the new insights, AI and machine learning come into play, as we transition from effective monitoring and analysis into an environment where we can give more real-time guidance about procedures.

**Q. Will non-digital technologies also be able to play into this environment?**

**A.** We now have a relentless focus on automation and bringing technologies to health care systems that add value, and are not just marketing tools. The ME1000 Surgical Impacter [currently only available in the US, and later in other countries] that we recently acquired from Medical Enterprises Distribution is a classic example of a great technology that automates steps in joint replacement and aims to increase efficiency and accuracy while reducing surgeon fatigue. There is potential to combine the ME1000 and robotic technologies that could reduce the time for performing some surgical procedures by up to 30%, clearly adding value to both the patient and our



healthcare customers. As Johnson & Johnson is the largest health care group in the world, we have access to a huge network of clinics. In this era of intelligent solutions and data gathering, we find ourselves in a strong position and able to differentiate ourselves from any of our competitors. In my mind, it's time-to-data, which means time-to-insight. It is important for us to keep focused, get these technologies to market, and make sure we bring them together in an intelligent way so that they optimize care. If we do that, we'll be in an almost unassailable position.

**Q. It seems that DePuy Synthes has found the angle it wishes to exploit in the digitally enabled and robotic OR spaces of the future.**

**A.** We've identified our role and strategy in the digital space, and our strategy is well evolved. Our robotics fit into the digitization of the surgical process. But there are always ways of improving, as technology evolves. Looking to

Verb Surgical, its value is that it cuts across all J&J's medical devices. (Also see "Exec Chat: How Verb Surgical Will Deliver On Surgery 4.0" - Medtech Insight, Nov 14, 2017.) It has made significant progress over recent years, and our job is to make sure we can synchronize it with other tools like C-SATS, SPI and our broader surgical vision. So, when we bring a best-in-class surgical robot to the market, it's in a best-in-class system that optimizes outcomes. Right now, the priority is to communicate to the orthopedic market but our vision goes beyond robotics. For us, it's a relentless focus on outcomes, clinical benefit and optimizing value for patients. To underline what drives our strategy, our technologies today are a platform in which robotics fit. Our ambition is to explain that to the world, and get partners to engage with us on that journey. We've had some strong responses so far.

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# A digital solution to reduce variability in surgical workflows for hip and knee arthroplasty at Asklepios Orthopädische Klinik Lindenlohe



## About the Institution

Asklepios Orthopädische Klinik Lindenlohe is part of a leading private hospital group in Germany. The orthopaedic department led by Prof. Dr. Heiko Graichen is recognized as an international reference center in arthroplasty (joint replacement).



## Needs Identification

Asklepios Orthopädische Klinik Lindenlohe wanted to increase the capacity of its operating rooms as well as the consistency and reproducibility of surgical workflows for hip and knee arthroplasty.



## Objectives

OR efficiency, consistent high quality of care, enhancing patient safety, improving team coordination and satisfaction.



## The Solution

1

The Surgical Process Institute (SPI), part of Johnson & Johnson, and Asklepios Lindenlohe worked together to implement a digital surgery solution designed to help surgeons and hospitals in delivering consistent high quality of care and efficiency in their OR. The solution enables surgeons to define and operate with step-by-step synchronized surgical workflows, guiding care teams seamlessly through every surgery and accessible anytime for training purposes and surgical performance analysis.

3

A dedicated SPI team that consists of project management, clinical and IT experts implemented all the elements defined by Asklepios Lindenlohe's arthroplasty team and delivered training sessions and supporting care teams in the OR for a successful project go-live.

2

To ensure SPI technology met Asklepios Lindenlohe's specific needs, SPI collaborated with key members of the orthopaedic multidisciplinary team including the surgeons, but also nurses, the OR manager and anesthetists to define together their optimal surgical workflows that will be used for every surgery. In this phase, key performance indicators were also identified to measure the impact.

4

The digital solution is integrated with Asklepios Lindenlohe's hospital information system (HIS) so that the surgery schedule can be directly imported in SPI's system and a digital operative report automatically sent back to the HIS after surgery for effortless documentation. The SPI team provides regular analytics reports to the arthroplasty team, giving valuable insights on their surgical performance.



## Results

↑ **>900 surgeries** performed with SPM since 2016

↓ **19% reduction in incision-to-suture time** on average for TKA and **14%** for THA\*

↓ **13% reduction in variability** for total knee replacement\*

↑ **1 more surgery per day** on average

↓ **Reduce stress level** in the OR and better team coordination

↓ **Reduce # trays & instruments** needed for hip and knee surgery

\* Asklepios Lindenlohe's data analysis for knee and hip arthroplasty between 2015 and 2018, data on file SPI.



“ The system enabled better team coordination and interactions between the nurses, the surgeons and the first assistants. For complex or less frequent surgeries, like a revision knee, it also helps my team prepare adequately and reduce the stress level in the OR.

**Prof. Dr. Heiko Graichen** – Medical Director, Chief Physician Orthopaedics & Trauma Surgery





# The Tailor Will See You Now – J&J’s EMEA VP Explains Total Care Partnership For Hospital Systems

ASHLEY YEO



**HUGO BREDÁ, MANAGING DIRECTOR,  
JOHNSON & JOHNSON MEDICAL DEVICES,  
UNITED KINGDOM AND IRELAND**

Johnson & Johnson’s global CareAdvantage system, a tool to help hospital systems deliver quality care efficiently and affordably, was launched in spring 2017. Almost a year into the initiative, Hugo Breda, the group’s EMEA vice president, explains the role that J&J plays as it brings its unique care provision concept to clients.

- J&J’s CareAdvantage program was rolled out on a global basis in 2017, with separate streams covering the US, EMEA, Asia-Pacific and Latin America – each of them adjusted to meet the different needs of their respective regional care delivery systems.
- The benefits across the stakeholder spectrum are compelling, with major potential reductions in inpatient length of stay, and significant time savings in the OR where costs can run to €1,200 per hour.
- So what? The transactional approach to saving health care system costs is no longer meeting the growing demands for cost-effective, high-quality care, hence Johnson & Johnson’s value-based comprehensive CareAdvantage hospital partnership scheme, explained here.

Although the US launch of Johnson & Johnson’s CareAdvantage program seemed to get a greater share of the headlines during the global roll-out in spring 2017, the Europe-Middle East-Africa (EMEA) part of the initiative is quietly and efficiently penetrating both minds and markets in its target geography. (Also see “J&J Ups The Tempo In The March Toward Value-based Health Care” - *In Vivo*, Feb 13, 2017.)

Hugo Breda, vice president of Johnson & Johnson’s strategic capabilities for medical devices, EMEA, says that the Europe and beyond regional roll-out of



CareAdvantage has gone well, so far. “We’ve had a lot of positive feedback on CareAdvantage in EMEA, and rolling interest in partnerships,” he tells *In Vivo*.

Breda, whose 20-plus year J&J career includes heading up operations in Benelux in 2013 having cut his teeth in Belgium, Austria, Switzerland and France, explains that EMEA regions have invested much in the training and expertise-building necessary to launch CareAdvantage. It is an initiative that has a triple aim of improving both patient outcomes and experience, and reducing the cost of treatment and care.

He continues, “It is the J&J answer to the health care challenges of today, the chief one being that we are seeing increasing demand for care while budgets are not keeping the same pace.” Europe has the additional challenges of older and more obese populations, and thus there is an anticipated rise in cancer, cardiac condition rates and orthopedic joint problems. At the same time, patients’ expectations have risen.

CareAdvantage is a global approach that has the subtitle, “solving starts with listening,” the J&J official says. It starts with identifying the opportunities to improve patient outcomes/experience and cut the total cost of care in the target hospital department or health care system. The next step – value creation – involves J&J experts creating a tailor-made solution. The third and final step sees J&J implementing, measuring and perhaps even contracting on the outcome. The target parameters that really matter for European hospitals are length-of-stay reductions, infection-rate reductions and freeing up hospital beds, Breda states.

The J&J group concept is harmonized globally, but in the EMEA region, hospitals tend to be more preoccupied with levels of funding and the demands and expectations placed on them. EMEA is very focused on the patient pathway, chiefly how hospitals can prepare patients better for surgery to produce better outcomes, and sustain less infection, and in general deliver the better after-care and follow-up that leads to fewer relapses and re-admissions.

Breda’s list of responsibilities at J&J includes the standard corporate buckets like health economics, market access, business insights, marketing and

## CareAdvantage Triple Aim

1. Identify opportunities to improve patient outcomes, cut cost of care.
2. Create a tailor-made solution for client hospital or health care system.
3. Implement and measure the solution.

training/education, but also “value creation,” a label that is illustrative of the committed approach of the group. “Other companies might do just some of the job, and offer a partial solution for hospitals – but we believe that, if we identify a certain solution for a hospital system, that solution needs to be tailor-made to fit its specific needs.” Even within a single country, there can be huge variability between hospitals, be they academic, private, large, small, etc.

### Auditing For Best Results

J&J has amassed examples of where patient engagement and pathway management programs can positively impact both length of stay and outcomes, be they clinical, patient-focused or financial. In total hip and knee surgery, where there is huge variability, it is often possible to reduce average length of stay by one, two or even three days in various EU health care systems. The improvements in clinical outcomes and patient experience play a big role in reducing the overall cost of care.

This is illustrated in a 2017 J&J investigation of 2,080 patients at Guy’s and St Thomas’ hospital NHS Trust, London, where the length of stay for total hip replacement (THR) patients was reduced by 20% to 42% (a 1.2 to 2.5-day reduction); and in total knee replacement (TKR) patients, the reduction range was 9% to 31% (0.6 to 2.0-day reduction). J&J concluded that technology-enabled programs can deliver substantial value, especially for patients who are older or who have medical complexities.

Another striking finding is that the CareAdvantage approach can, on average, reduce patient time in the OR by 20 to 30 minutes, depending on the hospital system. Every minute in the OR counts, not only due to cost reasons (a rate of €20 per



minute/€1,200 per hour), but also to improved outcomes: the longer the operation, the more risk of infection or co-morbidity.

This was proven in another UK study, at Wigan and Leigh NHS Foundation Trust, on theater capacity and surgical utilization (SU), where co-investigator Johnson & Johnson Customer Innovations proved that improved SU brings both cost and efficiency benefits. Together with the hospital, J&J developed a tailored theater efficiency program, based on lean management and using change management models (visual theater, rapid changeover and scheduling). The study was presented in 2016 at the ISPOR (International Society for Pharmacoeconomics and Outcomes) 19th Annual Congress, in Vienna, Austria.

Breda reiterates that infection control is a key focus for CareAdvantage in the EMEA region. He notes that up to one-fifth of all hospital operations across the region lead to a hospital-acquired infection (HAI) – at a cost of thousands of euros per individual case, depending on the type of operation. “Half of these infections are preventable, which is why CareAdvantage is so important,” he says.

### More Than Innovative Devices

And the nub of the concept, Breda points out, is the drive to do more than simply deliver an innovative device. Achieving the triple aim means J&J is targeting the full range of cost and clinical factors: reducing HAIs, and cutting procedure duration and hospital length of stay. “It needs a broader, bundled approach – merely providing a device is not sufficient to meet the challenges that our customers face.”

Some European countries are further ahead with this concept than others. In hips and knees, for instance, the major west European countries leading the way include Germany, the UK, the Netherlands, Italy and France. In these countries, the installation of technology/digital solutions can improve inventory management time by 70% to 80%; eradicating that waste enables more money to be invested directly in actions that have patient-impacting value.

In other EMEA zones, the focus areas and priorities may differ. For instance, Africa, the

Middle East and Russia have slightly different challenges – with younger populations and different diseases to tackle. These markets also have operational and logistical challenges to manage, which have encouraged J&J to partner with more than 100 local hospitals in logistical areas to rectify inefficiencies. The rationale here is that there would be little point in securing savings via the triple aim and then losing the benefits due to logistical shortcomings.

### CareAdvantage In Practice – Driving Out Variability

“The more complex the situation, the more value we bring,” says the J&J executive. There is a trend in Europe toward bigger and more complex health care providers and mergers of hospitals that “want to bring patient outcomes to a minimum threshold.” Driving out variability is an important factor, and this is an area of expertise that J&J has been investing in of late. The group acquired Germany’s Surgical Process Institute (SPI) in October 2017, which has technological expertise in harmonizing variability in patient care.

In surgical procedures, SPI can introduce standardization in big hospital chains using software that minimizes clinical variability in patient care. Says Breda, “We tailor both the solution and the outcome.” SPI’s products will be distributed by J&J in the EMEA region in 2018.

## A Software-Managed Method Of Better OR Utilization

SPI offers advanced software solutions to improve patient outcomes and OR efficiency by reducing variability in surgical procedures. Specialized in the standardization and digitalization of surgical workflows in the OR, the company uses Surgical Procedure Manager (SPM) proprietary software to enable better operating room utilization and consistent outcomes. Feasibility studies performed for stakeholder partner architects can be used to prepare a new OR, or to renovate existing facilities.



Hospitals' targets are set individually on a case-by-case basis. In some cases, J&J draws up contractual agreements where its payments are based on outcomes. It is a bespoke process, and there is very little identical duplication between clients. For instance, in some systems, length of stay has a negative impact for hospital funding; and in others, the longer the length of stay, the greater the funding. "Hence, the approach has to be very individualized – and tailor-made," says Breda.

In fact, they all have their own ways of working and their own challenges. "We develop a baseline, in, say, length of stay, look at the procedures and then agree upon the common targets together. It's not just J&J doing this, but a co-creation effort," he explains.

**"Shaping the procurement system to a value-based health care procurement system is a challenge, but it really fits what they want to achieve." – Hugo Breda**

It's a system that seems to be appreciated, "Overall, customers like this approach. The procurement and the reimbursement are often the challenges." This is because many health care systems are accustomed to tendering per SKU based on volume and price. "We believe that shaping the procurement system to a value-based health care procurement system is a challenge, but it really fits what they want to achieve."

New concepts come with cultural and educational demands, and the success of initiatives such as CareAdvantage at provider level depends on the buy-in of the hospital's management board. Breda maintains, "The C-suite of the hospital needs to be involved – it needs to come from the top and draw in the likes of the CEO, CFO and medical director." Once they're on board, things move; but if they're not, "you're fighting the system – albeit with a lot of goodwill – but it takes longer to form a partnership."

It's not all a one-way street though. Breda admits that change is required from J&J's point of view too. "We have legacy in surgeons and nurses in whom we have invested the biggest part of our commercial and educational offerings; and now we see a need

to engage more with the management and provide them with educational offerings."

So far, the response from customers to CareAdvantage has been very enthusiastic. But Breda's two decades or more in the industry have given him a rational approach to business. The initial response, he says, is generally always "open arms," but soon the talks shift to a "how can this work in practice?" approach, where often it is a case of dealing with systems and structures that remain too focused on cost and not on value. Then there is the change management process to factor in, and, as mentioned, the vital stage is to get the attention of upper management. "It takes time, but once you get to that stage, it's very fulfilling," says Breda, observing that the broader stakeholder circle is gradually coming to understand that the value-based approach is more durable than mere transactional relationships, and the drive for higher goals and a "real purpose" is a top agenda item.

The CareAdvantage process starts with an audit and the co-creation of tailor-made solutions. But because it requires a time investment, contracts can take between three and 12 months to be completed. Nevertheless, J&J has scored deals in all major EMEA countries, including in the Middle East, and has many conversations ongoing about future CareAdvantage partnerships. However, the aim is not to be "geographically focused," but to put hospitals and hospital groups – wherever they are located – in the J&J view-finder. "The biggest challenge is in the most complex organizations, and we are focusing on those first, and on customers that are more open to our approaches and have clear and obvious needs."

Breda sees J&J as offering a unique package in a competitive environment. The uniqueness comes from its broadness, and J&J's readiness to create bespoke solutions. On the contrary, rival manufacturers in this space can offer only a limited number of solutions, adds Breda, observing that such providers have no choice but to orient every negotiation toward their own solution. "But once J&J goes in, and the client agrees to tackle the triple aim, we audit, bring our system experts to the table and tailor a solution for you."



### The Residual Challenge – Value Versus Volume

Breda sees the major challenge in getting hospital systems more integrated, believing that most are focused not on value, but on volume and cost. The tricky step to negotiate is that hospitals at present still get their funding and reimbursement based on volume activity, and do costings accordingly. “We believe that if health care systems are serious about tackling obesity, cancer and all the other challenges in front of them, they will need to see procurement funded on value and outcomes, rather than just on volume.” If not, they will find they are unable to afford care delivery in the future as currently practiced.

J&J sees this shift – and its part in it – as crucial to its overall health care business. The New Brunswick, NJ, group was founded 131 years ago on the business of sterile sutures and dressing materials, and it aims to be in health care for the long term. “Improving the trajectory of health care is our purpose, and we have to adapt to the challenges.” Adapting means training, in one respect, and Breda notes that, in terms of internal training in medical device business affairs in the EMEA, he oversaw 80% more training in 2017 than in 2016 (which was already up on 2015) and is intent on bringing more expertise into the company to deliver on CareAdvantage.

Says Breda, “Besides more training and development, we’re doing more licensing and acquisitions than ever before to tackle the broader range of challenges for customers.” In terms of acquisitions, J&J is looking primarily for technologies that fit into the digitalization and technology transition that health care delivery is – albeit slowly – undergoing.

These will be the tools to decrease variability between ORs and hospitals in frequently performed surgical procedures. Technologies that promote patient engagement are also high on the priority list for J&J; in the future, hospitals will play a much larger role in patients’ journeys before and after their inpatient stay, in the patient experience, and in patients’ outcomes, with the real expectation of having a positive impact on hard clinical outcomes, length of stay and costs.

Engaging with patients up front also means encouraging the right nutrition, exercise and smoking cessation. After the patient leaves the hospital, digitally

enabled follow-up comes into play, and is already regarded as a more effective tool than having patients physically visit their doctor or the hospital.

### “If you address the needs of your customers, you can never be wrong.” – Hugo Breda

There is no stand-alone, separate CareAdvantage group within J&J, rather the solutions come from within and across the group, specifically focusing on four domains covering every J&J procedure. “It is very broad, encompassing orthopedics, general surgery, cardio and infection prevention.” The group has developed generic capabilities that can support all these patient pathways, from technology platforms such as its Care4Today brand, which engages with patients to prepare them for hospital stays to logistics solutions to inventory management. “It’s our tailor-made approach, and we have the technology and we can adapt,” asserts Breda.

CareAdvantage also enables J&J to set up partnerships with local providers and local start-ups that can bring new technologies to the table. “We are always scanning the environment to partner with technologies that complement our offering.” SPI is a prime example of this approach.

“If we address the needs of our customers by adapting, this has to be beneficial for our top and bottom lines. If you address the needs of your customers, you can never be wrong,” says Breda. J&J’s longer-term plan is to transition from transactional relationships to “real partnerships” and multi-year contracts.

“This is just the start; we are still rolling this out. We officially acquired SPI in October 2017 and we only started CareAdvantage in early 2017,” says the J&J EMEA vice president. Taking on the challenge of shaping procurement systems and funding is the next step for J&J. “Our customers agree that this is a need for them, and this is where there is still work to be done within the overall aim of contracting on value instead of just on pure volume and price,” says Breda. The bespoke challenge continues.

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# Máxima Medical Center, The Netherlands: Improving Outcomes Through the Implementation of Enhanced Recovery and Prehabilitation in Colorectal Surgery

This white paper was produced in collaboration with Dr. Gerrit Slooter, M.D., Ph.D., Surgical Oncologist, Máxima Medical Center, Eindhoven, The Netherlands.

*Dr. Gerrit Slooter is a paid consultant of Johnson & Johnson Medical Devices Companies.*



## Acknowledgments

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**Dr. Gerrit Slooter, M.D., Ph.D.**

Surgical Oncologist,  
Máxima Medical Center

This paper describes the journey undertaken by Dr. Gerrit Slooter and his team to improve the outcomes of colorectal surgery at Máxima Medical Center (MMC) in Eindhoven, The Netherlands; they achieved a significant reduction in complications, shorter hospital stay, better quality of life and delivered cost savings.<sup>1</sup>

Key elements that have led to this success are:

- the utilization of a multidisciplinary approach involving all stakeholders (doctors, nurses, management, and patients) across the pathway;
- high compliance to enhanced recovery principles;
- improvement of patient-related risk factors including prehabilitation (a four-pillar program to improve the patients' condition before surgery).

Dr. Slooter and his team are widely published in the fields of improvements in patient care and prehabilitation. They organized the 2018 World Prehabilitation Conference in Eindhoven, The Netherlands, and initiated the International Prehabilitation Society.<sup>2</sup> MMC is the colorectal reference center for JJMDC, where they showcase their Colorectal Care 3.0 program on patient pathway innovations and prehabilitation to other healthcare institutions. This program is designed to help multidisciplinary teams from other hospitals to improve their care pathway from referral to the end of follow-up, 5 years after surgery. Dr. Slooter and his team wish to continue sharing their knowledge in colorectal care and prehabilitation and learn from others mutually, in order to further improve patient care.

“

Stop talking, start walking.

– Dr. Gerrit Slooter, M.D., Ph.D., Surgical Oncologist, MMC



# Máxima Medical Center Before the Implementation of Enhanced Recovery Principles

MMC is one of the largest healthcare providers in the Southeastern Brabant region of The Netherlands, located at two sites in Veldhoven and Eindhoven. Since 2015, the center has been at the forefront of developments and quality assurance for colorectal surgery in The Netherlands. In part, this is due to the introduction of multidisciplinary involvement in designing the treatment pathway with the hospital's management and other specialties.

MMC has an extensive history in laparoscopic surgery, being one of the first hospitals in The Netherlands to offer a laparoscopic solution for all bowel operations since 2004. Since then, the hospital has played an important part in the nationwide rollout of laparoscopic colorectal surgery by:

- acting as a training institute in advanced colorectal laparoscopic surgery;
- organizing masterclasses;
- organizing national conferences on laparoscopy such as the annual Johnson & Johnson Expert Meeting on Colorectal and Liver Surgery;
- representing medical professionals on national boards such as the Dutch Society of Endoscopic Surgery and the Workgroup for Innovative and Endoscopic Surgery.

In 2015, the center reflected on the results of the 2012–2014 national level audit.<sup>3</sup> The Department of Colorectal Surgery concluded that the hospital's outcome parameters for colorectal surgery were at an average level and could be improved to better reflect a center at the forefront of colorectal care. MMC considered the National Dutch Institute for Clinical Auditing average to be a benchmark along with average outcome parameters for laparoscopic surgery from international literature. Particular outcomes that the center was motivated to further improve are illustrated below.

MMC outcomes data for 2012–2014 based on 190–200 surgical operations for colorectal cancer patients per year, of which >90.0% were performed laparoscopically\*

### Length of stay:

median hospital stay was **8 days**

### Complications within 30 days post-surgery:

**26.5%** of patients had complications  
mean comprehensive complication index (CCI) of **10**

### Anastomotic leaks:

**8.0%** of patients experienced anastomotic leak



These outcomes meant that **1 in 12 patients** were likely to require a further operation and a temporary or permanent stoma.

\*Data from MMC daily practice as referred to by Dr. Slooter in an interview on 5 December 2018.

Complications, such as anastomotic leaks, represent a significant burden on colorectal care. They have a considerable impact on a patients' quality of life, as well as on the burden of all healthcare providers involved in the care pathway.<sup>4</sup>

Anastomotic leaks are of particular concern to surgeons involved in laparoscopic colorectal surgery.<sup>5</sup> Surgeons at MMC have reported experiencing a considerable mental burden associated with supporting patients and their caregivers through such a serious complication.

The economic burden of anastomotic leaks on a hospital is also considerable. At MMC, the extra pressure exerted on facilities can lead to a 3 to 4-fold increase in the cost of care, compared to the cost of care for a patient without anastomotic leakage.<sup>6</sup>

“

It is the complicated cases we remember, while we forget the patients we cure.

– Dr. Gerrit Slooter, M.D., Ph.D., Surgical Oncologist, MMC



# Máxima Medical Center and Enhanced Recovery Principles

Since 2004, MMC has delivered peri-operative care for laparoscopic colorectal surgery according to enhanced recovery principles (see Appendix for more information), including the Enhanced Recovery After Surgery (ERAS®)<sup>7</sup> protocols. The ERAS® protocols comprise evidence-based measures designed to reduce the stress response and limit the burden of surgery on patients.

Important measures include:

- no long-acting sedatives before the operation and pre-operative carbohydrates;
- restrictive fluid management during the operation;
- temperature management;
- no gastric tube or abdominal drain after the operation;
- early mobilization and feeding following the operation (on the day of surgery).

The center introduced all 23 recommended ERAS® protocols and this coincided with the wide introduction of laparoscopic surgery. As a result, colorectal care progressed from old principles to evidence-based medicine. The center called this the Colorectal Care 1.0 program.

In 2014, MMC determined that its compliance with enhanced recovery principles was suboptimal. Internal investigation indicated that ERAS® protocols were being adhered to in only 30% of patient treatments. The center was therefore motivated to improve compliance with enhanced recovery principles. As such, improvement in overall colorectal care was the responsibility of all key stakeholders across the treatment pathway.

## Máxima Medical Center's Approach to Improving Care

In 2015, MMC convened 140 internal stakeholders across the colorectal care pathway. This inaugural meeting was dedicated to the new colorectal care pathway and focused on compliance with a fully integrated approach to pre-, peri-, and post-operative care. As a result, the Colorectal Care 2.0 program was

established. Monthly, cross-functional training in peri-operative care was used to reinforce the importance of all aspects of the treatment pathway and fully integrate key stakeholders working across different departments. In particular, the training highlighted that patient risk factors are the most important reason for the onset of complications (as published by MMC based on their hospital cohort).<sup>8,9</sup> Adjusting modifiable risk factors in patients was therefore the most important starting point for improving outcomes in colorectal care.

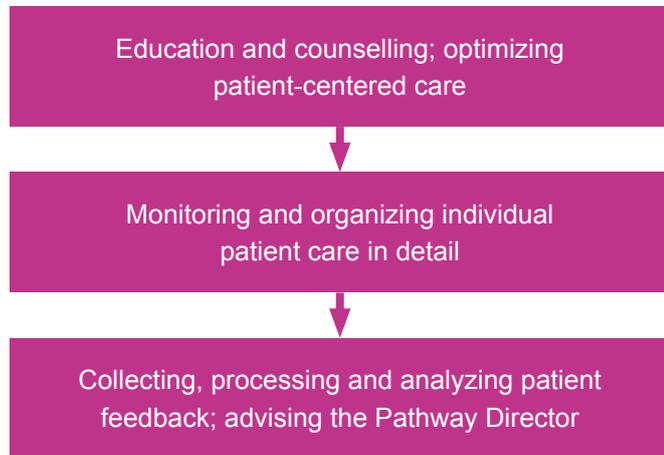


The improvement processes were driven by the Pathway Director and Surgical Oncologist Dr. Gerrit Slooter, M.D., Ph.D. He was responsible for:





Additionally, the center appointed three nurse specialists (Case Managers) to ensure improvements to the processes for colorectal care were in line with current scientific research. The Case Managers are responsible for:



Through the mutual exchange of information, as part of an international collaboration, colleagues from Montréal General Hospital and McGill University in Canada were also engaged to help design the improvement processes, including lean management systems.

## Introduction of Prehabilitation to Enhanced Recovery Principles

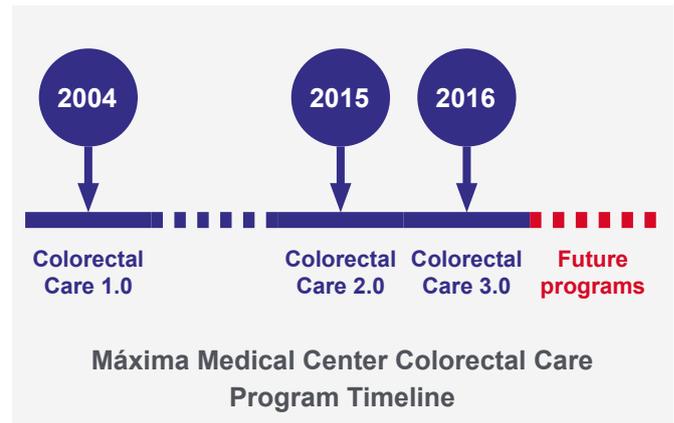
Prehabilitation can be defined as the multimodal preparation of patients prior to surgery. The addition of a 4-week period of prehabilitation to the enhanced recovery principles completed the Colorectal Care 3.0 program. In 2016, the MMC Colorectal Care 3.0 program was set in place, following the initiation of a clinical study for prehabilitation. Together with Professor Dr. Francesco Carli, Dr. Slooter and Stefan van Rooijen established an international consortium aimed at carrying out a randomized controlled trial in colorectal prehabilitation in more than 700 patients with colon cancer (the PREHAB study);<sup>10</sup> 50 patients from MMC participated in a pilot of this study.

All patients who were enrolled in the prehabilitation program improved their functional performance before surgery. Four weeks after surgery (follow-up as defined by the study protocol), 86.0% of patients who underwent prehabilitation reached their pre-operative health status (as measured by six strength and fitness

tests) compared with 40.0% of patients in the control group.<sup>11</sup>

Colorectal Care 3.0 was an integral part of the hospital's success in driving integration to deliver improved outcomes. Introducing this protocol ensured that the care pathway encompassed all treatment from the point of diagnosis to the end of patient follow-up.

MMC is continuing to drive improvement to their colorectal care pathway beyond Colorectal Care 3.0.



In 2018, MMC started to implement prehabilitation in other care pathways including liver surgery, bladder surgery, and lung surgery, amongst others. Furthermore, the center and Dr. Slooter continue to collaborate on the widespread implementation of prehabilitation principles at a national level; they are currently working with health system partners such as insurance companies and national authorities to set this in place. In June 2018, MMC organized the 2<sup>nd</sup> World Prehabilitation Conference in Eindhoven, The Netherlands and during this conference the International Prehabilitation Society was established. The 2019 event will be held July 2 to 3 at the British Museum in London, UK.

## Improved Outcomes Through the Colorectal Care 3.0 Program

As a result of MMC's implementation of its Colorectal Care 3.0 program, by the end of 2017 a considerable improvement in colorectal care had been observed, compared with 2012. Specifically, outcomes that previously reflected suboptimal care were markedly improved, including, and most importantly, the number of anastomotic leaks.



MMC outcomes data for 2015–2017 compared with 2012–2014, based on 190–200 surgical operations for colorectal cancer patients per year, of which >90.0% were performed laparoscopically\*



These outcomes meant there was a reduction in the need for intensive post-operative care from **1 in 12 patients to 1 in 40 patients.**

\*Data from MMC daily practice as referred to by Dr. Slooter in an interview on 5 December 2018.

Other examples of how the implementation of improvement processes has delivered improved outcomes at MMC:

### Temperature Management

Through better education, monitoring, and the introduction of a thermal jacket, patients are now operated on at normothermia (37.0°C). Before implementation, temperature was 35.5°C. Preventing peri-operative hypothermia is beneficial in reducing post-operative complications and can be cost-effective.<sup>12</sup>

### Correction of Anemia

Gastroenterologists are actively participating in the pathway. The day after endoscopy they start iron injections in anemic patients. In the weeks leading up to the operation, anesthesiologists check that hemoglobin (Hb) levels have risen sufficiently to 7.0 mmol/L (11.3 g/dL), instead of the limit used before implementation of 5.0 mmol/L (8.1 g/dL). This not only raises the Hb level but also improves the patient's overall condition<sup>13</sup> and their ability to benefit from prehabilitation.

### Optimal Patient Information

All protocols and patient information folders have been renewed. The Case Managers now guide patients through the pathway and support the doctors in the decision-making process. They provide detailed information throughout the whole pathway. Patient involvement is optimized by individual support in the pre-, peri-, and post-operative phases.

### Expectation Management

Since the content of the entire pathway is known to all caregivers at MMC, they can disseminate the same information. This means that patients know exactly what they can expect from the center's caregivers and how they can contribute to improving their own recovery. Patients are informed that they can be discharged 2 days after surgery, providing there are no complications. More than 50% of patients will be discharged after 4 days. If these expectations are not clear to patients and their family, discharge could potentially be delayed because home support has not been prepared.

### Colorectal Care 3.0 Course

Dr. Slooter and his team provide the Colorectal Care 3.0 Course on patient pathway innovations and prehabilitation.



We have helped multidisciplinary teams from many countries to redesign their colorectal pathway based on ERAS® principles and improvement of patient risk factors. It is our ambition to share our knowledge and protocols to help others make their care value-based and patient-centered pathways.

– Dr. Gerrit Slooter, M.D., Ph.D., Surgical Oncologist, MMC

Through the improvement of each patient's condition, and the re-emphasis of enhanced recovery principles, MMC reflects that patient outcomes for laparoscopic surgery have been elevated to the high standards expected of a specialist center.



# The Support of Johnson & Johnson in the Implementation of Enhanced Recovery Principles

Johnson & Johnson Medical Devices Companies (JJMDC) is committed to translating what is most valued by patients into value-based solutions for hospitals. The Company's ambition is to continue building collaborative partnerships with hospitals worldwide, to help achieve colorectal care pathway improvement.

This ambition is delivered through the CareAdvantage program, which is a data-driven, holistic partnership approach to help healthcare providers realize better care by aligning The Company's broad capabilities to specific needs.

JJMDC believes that solutions start with listening, which is reflected in the way the Company operates:

## Needs Identification

JJMDC defines challenges with its partners and performs analyses to define opportunities where it can help.

## Co-creation

JJMDC works together with its partners to understand how your needs can be addressed using the unique capabilities that stem from being part of the Johnson & Johnson family of companies.

## Desired Results

JJMDC implements a tailored approach to deliver results and measurable impact through comprehensive services and solutions ecosystem, which is connected by purpose and design.

As part of the CareAdvantage family of services, Patient Pathway capabilities are built with patients at the center. The Company offers custom designed pathway capabilities for comprehensive disease management that guide the coordination of care, standardization of key practices, and engage patients from hospital to home. This is supported by content, services and technology shaped to improve outcomes and patient experience, while eliminating inefficiencies and reducing cost of care.

JJMDC's capabilities leverage broad organizational knowledge and expertise to help its partners with challenges they may be facing as they shift to a value-based healthcare model to include:

- developing and implementing care pathways across multiple therapeutic areas;
- understanding how to improve consumer and patient engagement;
- reducing waste and achieving additional operational efficiencies within the peri-operative and supply chain areas.

Through CareAdvantage, we help hospitals and healthcare providers achieve the **'triple aim'**



Improve outcomes



Increase patient satisfaction



Reduce costs

To find out more about how Johnson & Johnson Medical Devices Companies can help you improve your patient pathway, contact [emeacareadvantage@its.jnj.com](mailto:emeacareadvantage@its.jnj.com).



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# Appendix

## Enhanced Recovery for Colorectal Care

Enhanced recovery is the process of delivering continuous improvement across the entire acute care pathway, centered on shared decision-making between the patient and their healthcare team. Enhanced

Recovery After Surgery (ERAS®)<sup>1</sup> is an evidence-based care improvement process for surgical patients that was pioneered by Professor Henrik Kehlet in Denmark in the 1990s. Professor Kehlet demonstrated that key steps in the admission, pre-, peri-, and post-operative phases, can accelerate recovery and improve clinical outcomes in colorectal surgery.<sup>2-4</sup>

### Recommended Steps for Colorectal Enhanced Recovery Principles<sup>1</sup>



#### Pre-admission items

General pre-operative medical assessment and optimization is intuitively important and can include:

- pre-admission information, education and counselling;
- pre-operative optimization including smoking cessation;
- prehabilitation;
- pre-operative nutritional care;
- management of anemia.



#### Pre-operative items

Pre-operative optimization is necessary before colorectal surgery. This can include:

- prevention of nausea and vomiting;
- pre-anesthetic medication;
- antimicrobial prophylaxis and skin preparation;
- bowel preparation;
- pre-operative fluid and electrolyte therapy;
- pre-operative fasting and carbohydrate loading.



#### Intra-operative items

There are a number of protocols outlined for optimal intra-operative care in colonic surgery including:

- standard anesthetic protocol;
- intra-operative fluid and electrolyte therapy;
- preventing intra-operative hypothermia (definition: <36.0°C);
- surgical access including laparoscopic surgery;
- drainage of the peritoneal cavity and pelvis.



#### Post-operative items

To ensure colorectal care is optimized following the operation, and to establish whether the care protocol has been successfully implemented, the following steps should be considered:

- no gastric drainage;
- post-operative analgesia (in laparoscopic surgery) – specifically the avoidance of opiates such as morphine to enable early mobilization;
- thromboprophylaxis;
- post-operative fluid and electrolyte therapy;
- urinary drainage;
- prevention of post-operative ileus;
- post-operative glycemic control;
- post-operative nutritional care;
- early mobilization;
- auditing.



### Patient Information and Engagement\*

Throughout the care pathway, patients should routinely receive dedicated information, education, and counseling, including tasks that patients should be encouraged to fulfil. This has been shown to improve:

- procedural fear and anxiety;
- peri-operative feeding;
- early post-operative mobilization;
- pain control;
- respiratory physiotherapy;
- post-operative recovery and rate of hospital discharge.

\*As observed in current practice.

Healthcare funding, resourcing, and (in some European countries) reimbursement challenges mean that the original aims of enhanced recovery to reduce length of stay and improve post-operative recovery<sup>4</sup> are increasingly relevant in modern surgery. Furthermore, as patient experience is now an integral part of an optimized management protocol, establishing enhanced recovery principles that in turn reduce the financial burden on healthcare systems, without compromising patient safety and improving quality of life,<sup>5</sup> would be widely welcomed.

Implementation of enhanced recovery principles, like ERAS<sup>®</sup>, can result in major improvements in clinical outcomes and cost, making them an important example of value-based care applied to surgery.<sup>6</sup>

## Prehabilitation for Colorectal Care

Prehabilitation is one of the key steps involved in enhanced recovery principles and is designed to utilize the period between diagnosis and surgery to prepare the individual patient as effectively as possible and optimize treatment outcomes. Máxima Medical Center is a national and international leader in this area and, as such, prehabilitation plays an important role in colorectal care at the center.

Prehabilitation is a pre-operative conditioning intervention that has been shown to improve patient outcomes in colorectal care when compared with rehabilitation started after surgery.<sup>7</sup>

Patients who undergo prehabilitation have shown improvement in pre-and post-operative walking distance, as well as pre-operative physical fitness, compared with those who only start rehabilitation post-surgery.<sup>7</sup>

Prehabilitation comprises four main components:<sup>5,7</sup>



### Exercise

Personalized training three times per week:

- endurance: 20–30 minutes high intensity;
- resistance: upper and lower body strength;
- flexibility: stretching and core stability.

The other days of the week, it is recommended that patients perform cycling or brisk walking.



### Nutritional Care

Dietary changes based on nutritional intake assessment. This also includes supplementation of vitamins and proteins in order to achieve a total intake of 1.5g/kg/day to enhance exercise.



### Smoking Cessation

Individual approach including nicotine replacement.



### Anxiety-coping Intervention

Mental support, relaxation techniques, and optimal patient information.

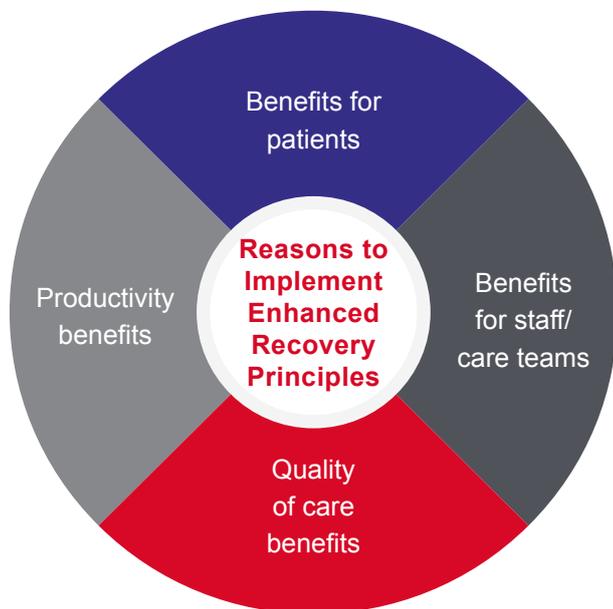
Prehabilitation in colorectal surgery is designed across 4 weeks to improve fitness status.



## The Benefits of Implementing Enhanced Recovery Principles

The purpose of change, as delivered through the implementation of enhanced recovery principles and prehabilitation, is to improve clinical outcomes, patient experience, quality of elective care pathways, and staff experience. As a result, this can lead to significant reductions in hospital length of stay and cost-efficiency savings through release of resource.<sup>9</sup>

The benefits of enhanced recovery principles extend to all specialisms involved in the colorectal care pathway, with improvements in the patient experience positioned clearly at the center.



Enhanced recovery principles demand a positive approach from the whole health community, including primary and secondary care, surgeons, anesthetists, nurses, and allied healthcare professionals. Embedding enhanced recovery principles requires investment and commitment for which hospitals will be rewarded with improved patient outcomes and cost efficiencies.

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# World In Motion – The Shape Of The New Health Care Technology Ecosystem In 2022

ASHLEY YEO



The health products industry, methods of care delivery and even the public's expectations for improved tools to prevent, monitor and treat disease have transformed dramatically in the past five years. The changes anticipated over a similar period ahead are potentially even more marked, with business continuity impacts for medtech and pharma concerns, according to Deloitte LLP experts who were on the circuit at health care industry events in Germany and the UK in spring 2018.

- Health care and life sciences are becoming industrialized on a global scale, now that eyes are finally opening to the advantages offered by – indeed the necessity of – adopting digital techniques and factoring in AI and machine learning in the delivery of care.
- Medtechs and pharma players must either embrace these system changes or opt to focus on their own best-in-class technologies. But either way, newly empowered patients will increasingly demand modern standards of care, higher quality, and better speed and affordability.

- So what? New attitudes, new business models, new hurdles and new entrants ready to take health care to the next level: it makes for a daunting prospect for medtechs and other commercial players who want to continue shaping the direction of the health care industry. But do they really have a choice?

Much to the routine consternation of the medical technology industry, health care has been famously slow at reinventing itself and leveraging the digital technology revolution of the 21st century. A lot of health care remains rooted in the last century, as other, albeit largely privately financed industry sectors, have sailed past it in terms of embracing innovation.

But matters are now changing in health care too, which, although behind the game, is now making promises about the radically different shape of health care to come in the decade to 2030. Philips Healthcare, one of the standard-bearers of IT-assisted health care, has leveraged its Intensive Ambulatory Care (IAC) telehealth program, built upon a population management software platform, to care for patients with complex conditions at home, which reduces hospital admissions. The group believes that digitally enabled health systems will by the end of the next decade be making full use of virtual reality and AI, offering networked care and prioritizing patient experience quality. Individuals, in turn, will have adopted proactive approaches to updating their data.

At the other end of the medtech scale, UK orthopedic company Corin Orthopaedics Holdings Ltd., which has undergone a change of ownership, has developed its own value-based business model centered around IT-assisted personalized delivery of hips and knee implants. Acquired by Permira, its strategy as explained to *In Vivo* is to meet the competition head on by focusing on information



about the patient to enable personalized surgery and/or rehab, for better outcomes and decreased costs. (Also see “Wright Place, Wright Time? Ortho Specialist’s Focus Is Paying Off” - *In Vivo*, Jul 26, 2017.)

Philips and Corin are just two examples of how the tide is finally turning, even if the changes are largely led by industry. Nonetheless, governments and policymakers are making efforts to catch up. UK prime minister Theresa May issued several future-oriented “grand challenges” to the wider national industrial ecosystem, two of which were health and well-being-related: transforming the prevention, early diagnosis and treatment of cancer, diabetes, heart disease and dementia by 2030, using data, AI and innovation; and ensuring an extra five healthy, independent years of life by 2035, in the healthy ageing grand challenge. Cynics might say that if Brexit-beset Britain is on the case, then the health care world must finally be in motion.

But more proof of this comes from Deloitte LLP, which released a report, *The Future Awakens – Life Science and Health Care Predictions to 2022*, in late 2017. The messages and predictions contained in the report, outlined below, have been gaining air time at medtech industry fora in Europe, including, Europe Medtec (Stuttgart, Germany) and Medtech Innovation (Coventry, UK).

## **Global health care expenditure is expected to reach \$8.7tn by 2020.**

Some statements and predictions in the report might sound overly confident, Deloitte acknowledges, but the trends will nonetheless be seen regionally at least, or maybe even down at individual hospital level. That was the rider given by Mark Steedman, a manager at Deloitte’s Center for Health Solutions, as he addressed Europe Medtec attendees in Stuttgart.

Karen Taylor, Deloitte’s Center for Health Solutions research director and the report’s author, echoed the sentiment later. Detailing the report’s six life science and health care trend predictions for MedTech Innovation delegates, Taylor issued the proviso that they represented an optimistic view and perhaps not all of the initiatives would be fully realized within

the five years. “But the evidence today does inspire confidence, because things are happening, and not just in little silos,” she tells *In Vivo*. “It’s not too far away in the imagination,” she contends.

So the direction of travel is set, and the journey speed is increasing, in spite of the fact that the cost of health care funding is still not matching the average 4.2% rise per year in global health care expenditure, which will reach \$8.7tn by 2020. Pharma spending alone will rise by 5% per year in the five years from 2017 to 2022 – twice the rate of the previous five years.

### **Diagnostic And Digital Tech To The Fore**

As for medtech, the global market is primed to reach \$529bn in 2022, with sales of in vitro diagnostics set to total over \$67bn by 2020. Funding for IVDs remains behind the curve, in spite of its central role in treatment decisions. In Europe’s largest IVD market, Germany, spending by the sickness funds on lab services and diagnostics was 2.91% of total spending in 2016, its lowest for six years, the German Diagnostics Industry Association (VDGH) reported. And while the sickness fund spend has increased by 71% over that period, spending on IVDs alone has risen by just 61%.

That is surely the wrong path. In fact, diagnostic medicine is one of the two principal domains for the future of health technologies (along with digital), according to Sir John Bell GBE, Regius Chair of Medicine at the University of Oxford (UK) and author of the UK’s report, *Life Sciences Industrial Strategy*. There will be huge opportunities in that space because if a diagnostic isn’t targeted and precise, the therapy won’t work, he believes. The market for precision medicine is expected to reach \$87bn by 2023, says Deloitte.

### **Six Of The Best For 2022**

Moving forward to 2022, Deloitte’s predictions from 2017 are having effects on health care delivery in the following ways:

*Individuals are more in control of managing their own health in 2022.* This is largely down to expanded knowledge generally and to genetic profiling in particular by the “genome generation,” which is, by now, very involved in its own health



care. People visiting physicians in 2022 are more aware of their conditions and more active in preventing and managing them, ready to spend time and money to stay healthy. They interact better with health care practitioners (HCPs), but they are also more demanding, keen to be proactive and preemptive. Monitoring alone is often not enough for the category of patients that Deloitte calls the “quantified self.”

Evidence of this is seen in the proliferation of self-care and monitoring apps, like OurPath with its initial focus on weight loss and diabetes prevention. (Also see “Test Beds, Digital Hubs And Innovation Tariffs Top Medtech News At UK’s NHS Expo” - *Medtech Insight*, Sep 15, 2017.) Providing scientific evidence to coach people through a weight loss program, including advising on sleep patterns and eating habits, is delivered over a six-week program. The app originator struck partnerships with large pharma companies and National Health Service (NHS) England based on its ability to reduce the progression from prediabetes to clinical disease. Saving money is one of its main goals.

Biosensing wearables have become fairly commonplace in 2022, and individuals are being encouraged to use the data derived to further improve prevention. Older people have become better adopters of connected devices and virtual assistants, meaning this demographic is now monitored and better cared for at home. Similarly, the growing confidence in telemedicine in 2022 has meant that patients are opting for it even for an initial consultation. People in remote areas are benefiting from programs such as SENDoc, a multinational northern European initiative to evaluate the use of wearable sensor systems to support independent living in rural, ageing communities.

Incentives are being offered for good health care behavior, via gamification and other initiatives. The system is benefiting from policymakers’ more active roles in ensuring the ecosystem is ready. In May 2018, Scotland issued a new national Digital Health and Care Strategy to better seize the opportunities offered by digital and ensure that data science becomes mainstream in health and social care. This measure aims to reshape and equip services for the future, while further empowering users.

Such actions are welcomed, for although individuals have taken on a lot more responsibility to make the system work, led by go-ahead countries such as the Netherlands, there has been a disconnect in that health care systems have not helped as much as they should in terms of funding, Steedman tells *In Vivo*.

On a macro level, environmental planners are routinely incorporating health into all planning and development ideas leading to “smart cities.”

*Digital technologies are delivering patient-centric care.* Digital technologies have transformed the culture in health care, and “smart health care” is delivering more patient-centric, effective care. Clinical roles are being optimized and staff are using cognitive technologies to deliver seamless integrated care designed around patient needs. The vision is for robotic process automation (RPA) and AI to coordinate internal clinical workflows, allowing nursing and other staff more time to provide care.

“That is the goal that we are hoping for 2022,” says Steedman. The importance of robotics and AI was not identified so acutely in Deloitte’s 2014 report, *Future Awakens*, which predicted the scenario in 2020. There has been a major shift there.

Back-office functions and supply chain activities are increasingly automated in 2022, and clinical decision-making is being enabled by centralized digital command centers. This is certainly happening in pockets of activity. One example is the Mercy Virtual Care Center in Missouri. (Also see “Digital And Connected Care Are Pushing On An Open Door – But Is Medtech Ready?” - *In Vivo*, 28 Mar, 2018.) It opened in 2015, covering some 40 hospitals in seven neighboring states. It has no beds, and no inpatients, but has 300 staff onsite and another 300 offsite who monitor patients virtually by telehealth. In 2017, the center was able to treat some 1,300 ICU patients in their own homes, saving \$50m. Average patient stay length in the satellite hospitals has been cut by one third.

Steedman believes that we will see a lot more telehealth and these types of monitoring technologies, proving that patients don’t necessarily need to be in a hospital to be treated.

Patients are increasingly taking digital control of



their data. Patients Know Best is a reference system that allows patients to control all of their data. They can see their full medical record and share it with health care professionals wherever and whenever needed. They can also add their own data, and are currently able to transfer data from over 100 wearables and devices. A number of different devices and wearables can also link into the record.

The rise of the electronic health/medical record (EHR/EMR) has fueled the notion of the paperless hospital, which has caused quite a stir but also some over-heightened expectations, including in the UK, Steedman observes. That, plus the use of smartphones and tablets by nursing staff, will make a huge difference, in time, in terms of accurate and early diagnosis of obesity and depression and other conditions with the help of customized questions and ability to make treatment decisions.

*Medtech and pharma innovation processes are becoming industrialized.* Automated processes have accelerated pathways for regulatory compliance, reimbursement and supply chain activities, which means a certain redeployment of staff in pre-automation manual roles. Market access is quicker and more predictable, in what Steedman calls the fourth industrial revolution, which has unfolded as advanced cognitive technologies have improved core processes.

Product launch preparations have been standardized and predictive analytics is being used for market research, to improve the consistency and impact of product launches. Standardization and consolidation are the core of the first of three phases in the industrialization of health care, says Deloitte. The next stage is automation, leading to high-frequency output based on quality and structured data, and the third is utilizing machine learning and AI to increase the pace and productivity of these processes further.

Companies are operating more like software organizations, focused on managing and analyzing data to create value. The industrialization process also factors in with technologies such as blockchain, to enable safe data linkages. Steedman comments that the goal of embedding privacy and security in technologies is solution agnostic, so whether blockchain is the answer is still up for debate. But

the expectations around security of data have risen exponentially, in the wake of high-profile stories about the wrongful use of personally identifiable information. National blockchain contracts are emerging (Dubai and Estonia), but it may be in this instance a case of waiting to see the evidence of outcomes before it takes off.

A key benefit of industrialization is the reduced time needed to set up contracts, with improved transparency, simplified processes and enhanced stakeholder collaboration cutting the time needed from up to eight weeks to between one and 10 days, making the “contract in a day” an attainable goal.

*AI and RWE are really unlocking the value of data.* Data are set to “be the new health care currency.” In the past, systems generated a lot of data without necessarily capturing the information well. The next challenge is to utilize the captured data, and that is what Deloitte wants to see happen in the coming years to 2022.

The pace and adoption of technology has increased markedly, as witnessed by the deluge of health apps (260,000 were made available by publishers in 2016) and pharma moving toward a patient-centric approach.

Turning real-world evidence into real-world data and using that data to make impactful changes to the health care and life science industries will be really transformative. As the cost of health care is rising, the challenge is to utilize data and the IoT to reduce cost – deploy automation more, speed up processes and use data in ways that haven’t been instituted before. The Google subsidiary DeepMind is trying to create ways to make patient data safe. It has conducted much work on AI and is trialing NHS projects. It is now aiming to develop world-leading standards on encryption.

Another example given by Steedman is the Broad Institute of Massachusetts Institute of Technology and Harvard University, which is utilizing data to understand individuals’ genetic makeup, and using the knowledge to target specific diseases and understand individual susceptibilities, and to be able to address them both in the future.

*Evidence of future possibilities is already emerging.* Exponential advances in life-extending and precision



therapies are already improving outcomes. The launch of CAR-T cell therapies will be transformative, with CAR-T technologies likely to play in a market of \$10bn in the next 10 to 15 years. Whether this technology can be extended to solid tumors or other types of cancer is another matter, but in terms of where we were a year ago, it's pretty exciting, says Steedman.

The US, again, has proved that it is ready to put programs around these developing technologies. The 21st Century Cures Act set aside funding for cancer, brain, precision and regenerative medicine, and provided for regulatory change too. The aim of such programs is to address conditions like dementia, which affects 50 million people globally, but which has been without a drug breakthrough in 15 years – that was when the US FDA last approved one. “That’s going to be a big push. Whether pharma can create a dementia drug will be the proof of whether the future of health care comes true or not,” Steedman contends.

*New entrants in health care.* These are disrupting health care and the blurring the boundaries between the different stakeholders in the health care and life sciences industries. This is already happening. In 2017, the Amazon-JP Morgan-Berkshire Hathaway combination was one of the year’s biggest talking points, and yet few people still know what this combination is going to do. “But they have the potential, the power and the expertise to apply what they do in their own industries and apply them to health to really disrupt what’s going on now,” says Steedman.

We are seeing all the big tech giants getting involved in health, whether conservatively or broader scale, but Amazon’s Alexa and Apple’s Siri, and the like, are laying the ground for a revolution in health care by 2022. Health-centric devices such as the Apple Watch, and that group’s ResearchKit, which is

already producing medical insights and discoveries; and its personal care service (CareKit) are proof that the disruptors are putting a lot of investment into what they think will take health care to the next level.

### Global Trends

Across all the six predictions, Deloitte sees three key enablers that will make the vision of 2022 become a reality. Firstly, the adoption of new technologies – AI, the use of real-world evidence, innovative medical devices – will change how the life sciences sector functions.

Secondly, there is a need for new talent and the appropriate skills to maximize the value of the new technologies and ensure nurses and other professionals are trained to use them; and thirdly, there needs to be a slight rethink in how regulators work with industry.

**“Medtech is quite critical in delivering value-based care, but there will be winners and losers.”**  
– Karen Taylor, Deloitte

The risk-averse attitudes that are the foundation stone of regulation will need to be reappraised selectively to ensure that initiatives like the FDA’s Digital Innovation Plan can become less the exception and more the norm.

Taylor concludes that the role of medtech in this health ecosystem is changing, influenced by connectivity and improvements in the way data are exchanged. Medtechs need to take a look at themselves and be prepared to take risks. “Medtech is quite critical in delivering value-based care, but there will be winners and losers.”

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