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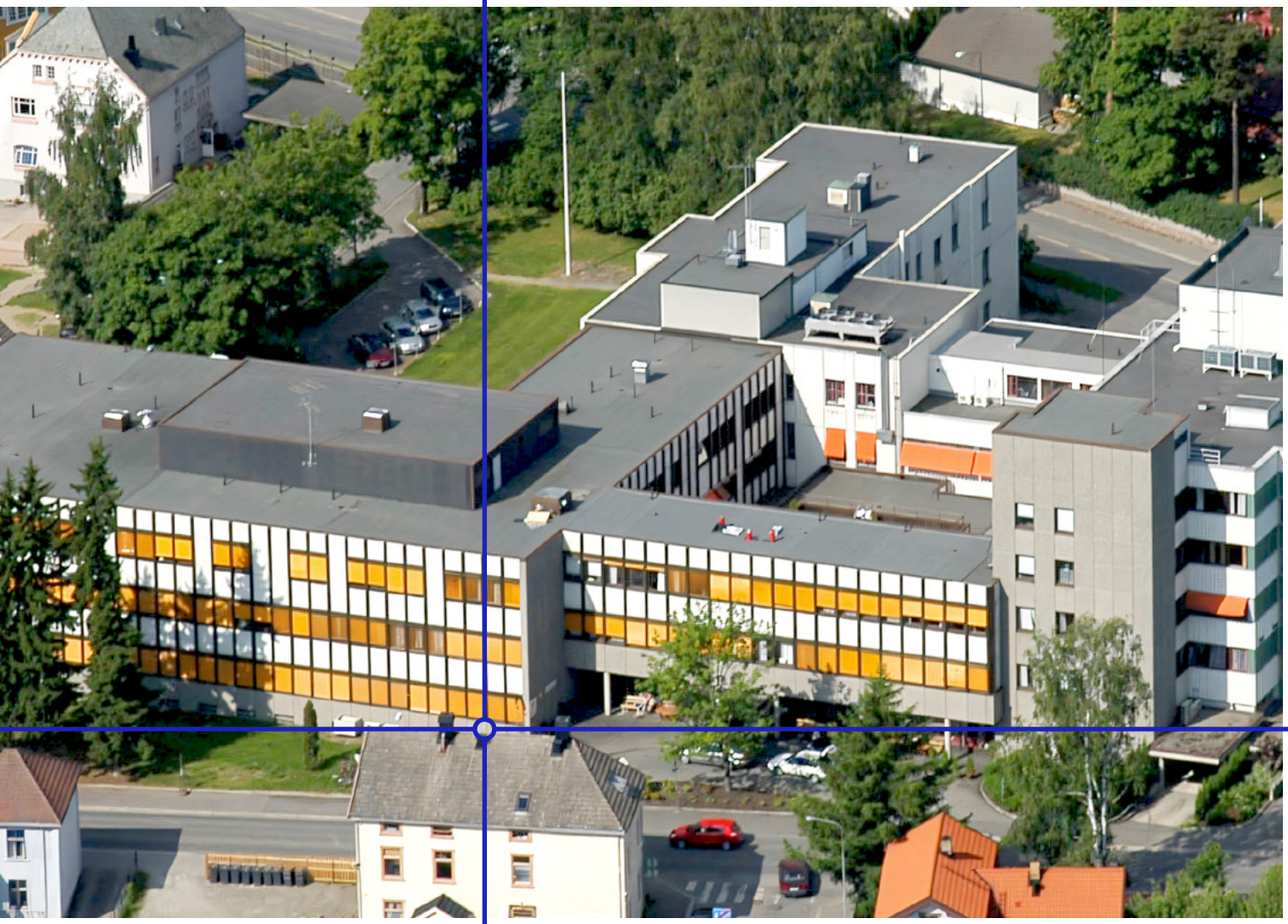

How a small hospital in Norway is realizing da Vinci surgery's potential

Hospital

Innlandet Hamar Hospital, part of Sykehuset Innlandet Health Trust, a division of Helse Sør-Øst Health Trust

Location

Hamar, Norway

Hospital beds

- 59 surgical
- 8 shared ICU beds
- 23 daycare (outpatient)

Da Vinci program

- Established in 2013
- Two da Vinci surgical systems in use
- 4,000+ da Vinci procedures (colorectal, general surgery, gynecology, urology)

Major themes

- Cancer surgery
- Benign surgery
- OR efficiency
- Care quality
- Cost effectiveness

Background

Innlandet Hamar Hospital is a small public hospital in Hamar, Norway, focused on improving care quality while maximizing efficiency and cost effectiveness.

Story

Hamar began its da Vinci surgery program in 2013 with the da Vinci Si, upgrading to the da Vinci Xi in 2014. In 2021, the hospital acquired its second system, a da Vinci X system. Since beginning its da Vinci surgery program, Hamar has successfully implemented clinical and operational best practices that allow it to meet regional demands for high-quality surgical care for cancer and benign conditions.

Key take aways

- **Clinical** – Improved outcomes and MIS access for cancer and benign cases compared to Lap and Open techniques, across specialties
- **Operational** – Increased patient throughput, averted bed shortages, high staff satisfaction, greater technology utilization
- **Financial** – Maximized profit, lowered total cost per case
- **Strategic** – Higher case volume, increased bed availability

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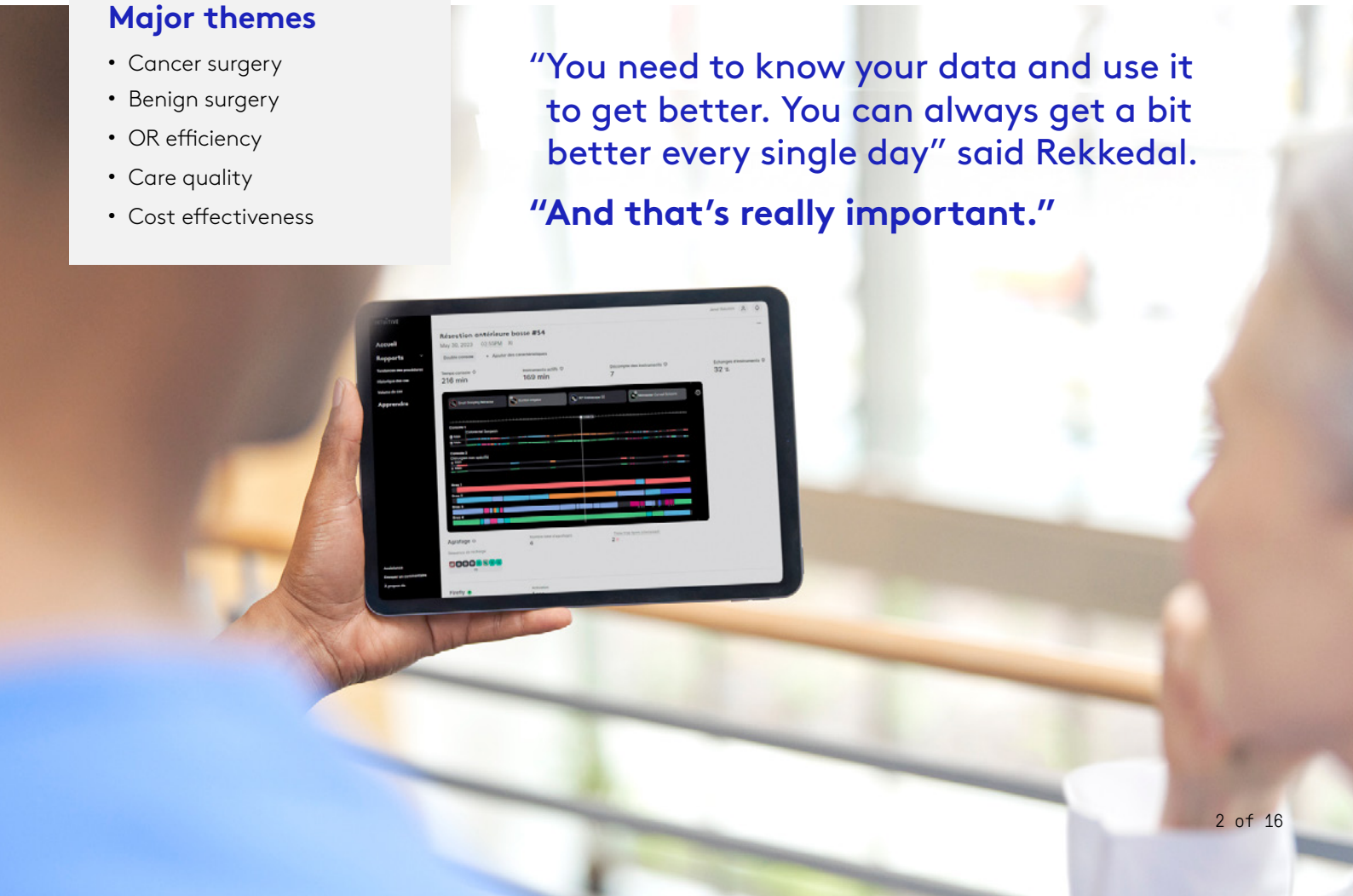
"And that's really important."



A small hospital with big responsibilities

Hamar Sykehus is one of six somatic hospitals within Norway's Innlandet Hospital Trust, part of the country's universal healthcare system. Located 130 kilometers north of Oslo, Hamar is a public hospital with just 59 surgical beds and eight operating rooms considered quite small by today's standards. While the hospital could easily care for the less than 30,000 people living in the Hamar municipality, it is also charged with serving about 370,000 people—including the more than 36% who are age 65 or older—living in the Innlandet region's 52,113 square kilometers, an area larger than Denmark. Innovation and efficiency are the keys to making that possible—and Hamar hospital has embraced both with Nordic vigor.

Hamar took an important step to meet its service challenges by bringing in a da Vinci Si surgical system in 2013 and quickly transitioning to the da Vinci Xi surgical system when it became available in 2014, making it one of the first hospitals in the world to use the Xi system. On the topic of innovation, it's interesting to note that Hamar was also the first hospital in the world to acquire Integrated Table Motion, which joins the patient table and da Vinci Xi system to enable intraoperative patient positioning for better anatomical access.

Making the case for da Vinci

It took some time to convince hospital administrators of the need for a da Vinci system because, as Håvard Kydland, Hamar's deputy CEO from 2011 through 2023 said, "In Norway, as in a lot of other countries, many felt that this was a kind of technology they should just use in the university." It took vision to understand how such a small hospital located so far from a metropolitan area could achieve economic viability with da Vinci technology. It was up to the surgeons who wanted the da Vinci surgical system to argue the case.

Dr. Ola Christiansen, a urology surgeon and strong advocate for the technology, remembers the journey of persistence. Christiansen and a fellow urology surgeon, Anders Selnes, spearheaded the effort. "We were tapping on the director's door several days a month. And he was quite tired of us," Christiansen said with a laugh.

But two strong arguments won the support needed. "Before we got the da Vinci surgical system, about half the patients referred for a prostatectomy preferred the robot," said Christiansen. "So, they chose to be treated elsewhere." In Norway, if a patient within Hamar's region decides to go to a different hospital for care, Hamar must pay for the treatment. That doubled the pain—in addition to losing income because the patient went elsewhere, Hamar had to pay the other hospital for the service.

The second reason was surgeon utilization. Open and laparoscopic procedures require two experienced surgeons on either side of the patient. "But with the [da Vinci] system, we use one surgeon and one first assist nurse," said Christiansen. "It's more efficient, and we don't need two surgeons to do the procedure properly." That change reduced intraoperative costs and freed up the second surgeon's time.

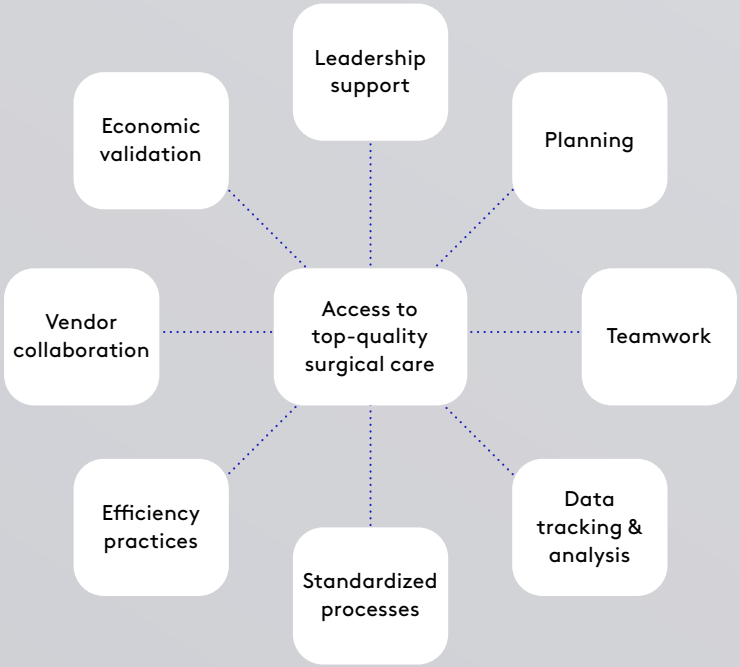
Expanding while improving

From the start, Hamar hospital intended to expand the da Vinci's use to multiple surgical specialties. Urology was the first specialty to use the da Vinci. Within six months, the program expanded to colorectal surgery, followed by gynecology surgery three months later. Today, Hamar surgeons perform surgeries for cancer in urology, colorectal, and gynecology specialties. But they also perform several procedures for benign conditions, such as cholecystectomies, hernia repairs, benign hysterectomies, benign prostate surgery, and colorectal surgeries for nonmalignant conditions. In fact, Hamar surgeon Jan Lambrecht has earned a national reputation for performing ventral hernia repairs requiring abdominal wall reconstruction.

The da Vinci Robotic Assisted Surgery Program grew so much that in 2021, the hospital brought in a da Vinci X surgical system to meet the demand. Each system is now used in about 450 procedures per year. To date, Hamar hospital has performed more than 5000 da Vinci surgeries and has become one of only a few total program observation centers in Europe.

So, how did a small public hospital outside Norway's urban centers become an international model of da Vinci surgery excellence?

There isn't a single good reason. Instead, there are many. Hamar has combined a just-right balance of several ingredients to bring about the success of its da Vinci program.



With a focus on providing access to top-quality surgical care, Hamar hospital brings together a winning combination of people, processes, and da Vinci technology to serve the needs of patients living in Norway's Innlandet region.

Focus on quality

Before diving into the ingredients, it's helpful to understand the outside forces that affect Hamar hospital and the part private healthcare plays in Norway. While the vast amount of patient care takes place under the Norwegian government's public healthcare system, private hospitals and healthcare providers are available to those willing to pay for them.

Dr. Lars Martin Rekkedal, chief operating officer and a practicing general surgeon, has worked at Hamar since 2013 and has been with the da Vinci program from the beginning. As COO, he's responsible for ensuring the hospital delivers excellent care while remaining economically viable. "I know that my quality must be at least as good as, and hopefully a lot better than, the private sector, or I will lose patients to the private sector. Private hospitals have more money, newer and bigger buildings, and they can pay personnel more than I can," said Rekkedal. "But what I can give my personnel is science research possibilities and the feeling of actually delivering better care and faster care to patients than the private sector."

"With da Vinci's lower length of stay, improved outcomes* and staffing efficiency, we started building more daycare protocols in 2019," said Rekkedal. "Lower working load with the daycare patients helps staff, resources, and the entire hospital."

There's strong agreement at Hamar that da Vinci systems have played a major role in enabling surgeons to deliver better quality care. "I feel very comfortable when I'm operating on the da Vinci surgical system. I feel safe," said Dr. Anne Birthe Lømo, gynecologic surgeon. "I did lap surgery before da Vinci, vaginal assisted as well. I didn't think about the challenges those modalities presented at the time, but now I do, knowing that with da Vinci I have more articulation, visualization, ability to move instruments simultaneously. And our patients have had very few complications."

Christiansen agrees, whether the surgery is performed to treat cancer or a benign condition. "It's a minimally invasive procedure. The trauma is less. They leave the hospital earlier," he said.

"There are so many good things with Robotic Assisted Surgery, with almost no complication and shorter stays," said Kydland, "that people want this technique. You could perform good surgeries with open or laparoscopic. So, it's not just a question of quality, but of service."

* Source 1: https://www.fhi.no/en/publ/2024/Robot-assisted-rectal-resection-for-rectal-cancer/

Source 2: https://www.fhi.no/en/publ/2024/Robot-assisted-prostatectomy-for-prostate-cancer/

Faster access to care

As Kydland noted, care quality involves service, which includes patients being able to access the care they need without long delays. Having two da Vinci surgical systems available has greatly accelerated access. This was especially important for Christiansen and the other urologic surgeons working to ensure patients received prostate surgery within the country's time limit between diagnosis and care.

Before the first da Vinci surgical system, Hamar surgeons were performing 70 to 80 open radical prostatectomies a year. "I think the first year we had the da Vinci, we did about 120," said Christiansen. "Afterwards, we did plus or minus 200 a year."

Surgical volume has increased across the spectrum of da Vinci surgeries. The technology contributes to the faster times and higher volumes, with teamwork, standardization, and workflow efficiencies also playing their parts. Today, for example, Hamar surgeons can perform five da Vinci cholecystectomies a day.

But for a hospital with only 59 beds for surgery patients, having enough beds to accommodate more surgeries presented another challenge. While Hamar admitted relatively few patients with COVID during the pandemic compared to urban hospitals, the pandemic reshaped traditional thinking around hospital stays. "There was a change of mindset for the patients and surgeons," said Kydland. "We have gone from hospital stays of a few days to one day and same-day admissions." The new mindset tied in well with the da Vinci surgery program's already-established success in reducing hospital stays.

"With da Vinci's lower length of stay, improved outcomes, and staffing efficiency, we started building more daycare protocols in 2019," said Rekkedal. "Lower working load with the daycare patients helps staff, resources, and the entire hospital."

However, shortening patient stays created its own set of challenges. Norway's system of hospital payments intentionally encourages overnight stays for many types of surgeries, making same-day surgery costly from a reimbursement perspective.

Still, Hamar found that by making changes to the patient flow and providing surgery with da Vinci systems, same-day surgery was popular with patients and that the increased volume made up for the economic impact. Most important, freeing up patient beds helped reduce surgery wait times for patients.

One way the hospital was able to reduce the length of stay was by having patients come in on the day of surgery. "Previously, you were admitted to the hospital the day before surgery and were prepped for the next day's surgery," said Rekkedal. "Now patients prepare for surgery at home and come in on the day of surgery. And a lot of them go home the same day."

Surgery for benign conditions

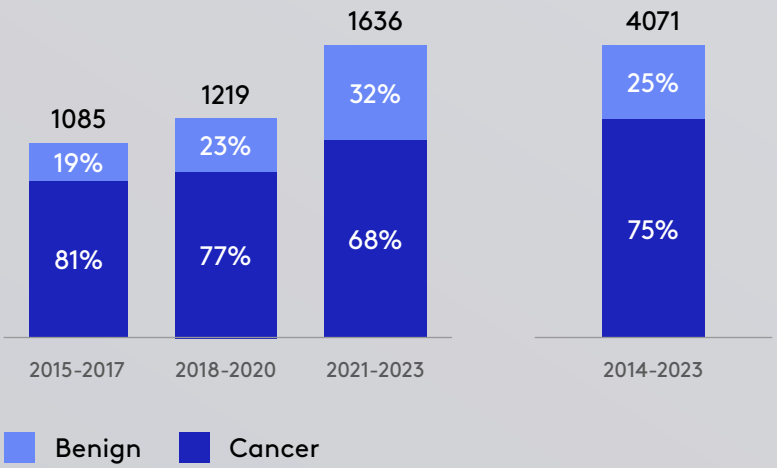
For years, many believed da Vinci surgical systems should be reserved for cancer surgery and other complex cases. While the technology undoubtedly helps with difficult surgeries, it's equally beneficial in simpler surgeries for benign conditions. The surgeons at Hamar understood that from the start. Within a few months of starting the da Vinci program, Dr. Lømo began routinely using the system to perform benign hysterectomies.

Surgeons also use both systems to perform cholecystectomies, hernia repairs, and simple prostatectomies. To make routine surgeries economically viable, Hamar's finance department performed an analysis to determine the breakeven point for different procedures. For cholecystectomies, that number was three, which inspired the team to work with Intuitive's Genesis team to find a solution for completing five per day.

"What we've seen is that the variability from the difficult cases and the easiest cases is being reduced quite a lot," said Rekkedal. "We have a scatterplot showing the operating time and the OR turnover times for easy and difficult cases. With the robotic cases, times for difficult and easy cases are almost the same because we've reduced variability. We're doing unselected cholecystectomy cases. And whether the case is acute or chronic, it doesn't matter. We're doing it the same and at the same speed."

That standardization has enabled the team to take in some emergency cases that come in during the weekday da Vinci surgery hours of 8 a.m. until 3 p.m. Eventually, if staffing allows, Hamar may be able to extend the da Vinci surgery hours to accommodate more emergency procedures across a wider spectrum of cases.

Da Vinci cases in Hamar Share of benign increasing over time



Source: Intuitive data on file
Note: Based on directional data on cancer vs. benign case. Approximately 1-2% of cases have been excluded due to insecure classification

A culture grounded in teamwork

Processes and technological advancements only go so far in increasing surgical volume. The glue that holds it all together is the people who are steadfastly committed to doing their best to further the goals of the larger team.

First-assist nurses, in particular, stand out for their vital role on the team. In addition to providing patient-side assistance during procedures, first assists prepare the da Vinci system, instruments, table position, and patient so that surgeons can begin surgery the moment they enter the room.

Leader of the first-assist team of 13 OR nurses. Kjønhaug has worked at Hamar for 33 years and been part of da Vinci robotic assisted surgery program since the beginning. "When we started with da Vinci surgery, it was new for the surgeon and the OR nurses, so we came into it together, which I think was a good strategy."

"With the da Vinci pathway, you're operating as a team," added Rekkedal. "It's not just a single surgeon entering the room. The nurses are as much of a part of a team as the doctors are. Our med tech is part of the team. Even the sterilizing team is a really, really important part of the logistics. We can't do five cholecystectomies a day without involving all of them."

"We travel with our surgeons for training, to build teamwork and collaboration," said Hilde Kjønhaug

Data-driven collaboration and planning

Hamar's surgeons and administrators have been diligent about collecting and tracking data from the start of the da Vinci program. The hospital's robotic steering committee and others use the hospital's internal data and data provided by the da Vinci surgical systems to build dashboards and processes that constantly monitor productivity, quality, and daily OR utilization. Such consistent data collection and analysis provides the team with solid information on how many patients per procedure type and system they can manage in any given period.

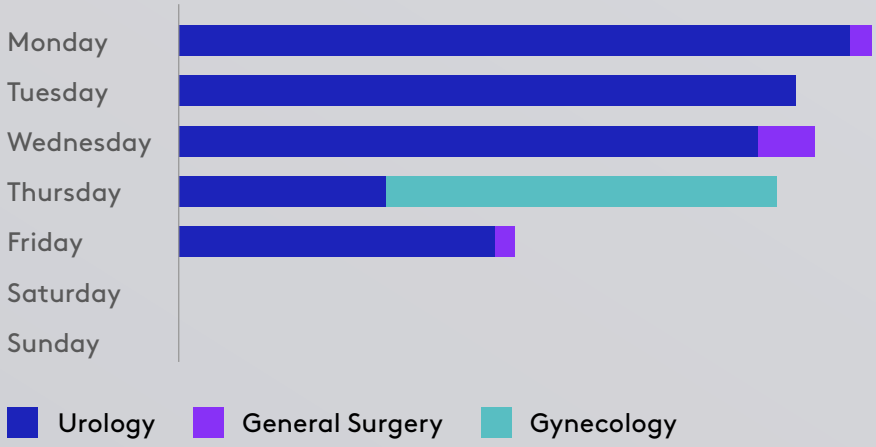
"You need to know your numbers absolutely—and at detail. And then you need to actually be able to show them in an easy visual manner," said Rekkedal. "But it's the entire team that needs to know the numbers. When asked how we motivate all team members, the answer is simple, 'Involve them!' They need to see that they are as much a part of the team as the surgeon."

One way Hamar engages team members is through an annual planning session. Surgeons, first-assist nurses, anesthetists, the med tech, and postoperative care leaders attend—all the major participants from every area involved in a surgical patient's care.

The annual planning meeting is where the team uses that information to lay out detailed plans, which include planning all holidays and special training for personnel throughout the year. Setting down the plan and getting agreement from all participants provides predictability and avoids conflicts down the line.

"We're actually quite hard on this level of strategic planning," said Rekkedal with a smile. "So, no one comes in halfway through the year and says someone needs to take time off this week. I can point to the plan they agreed to and say, 'No, they don't, because this week we're planning that this will happen.'"

2023 Q4 utilization of da Vinci systems by weekday and specialty



Source: Data analytics provided on My Intuitive Customer Portal, available to Intuitive Customers

Standardization as the key to efficiency

The special ingredient at the heart of Hamar's success might be the way surgical teams have reduced variability by standardizing OR setup and workflows. For every surgery, Hamar's OR team knows which instruments the surgeon will use, port placement, and table position (for surgeries on the Xi). Anesthesiology also follows standard protocols that vary less by procedure than by patient characteristics.

When Dr. Lømo began performing gynecologic surgeries in 2014, the move to standardization was already underway. "I was quite lucky because the urologist and first-assist nurse started with the da Vinci before me. They knew what worked and what didn't," said Lømo. "Then they started the colorectal surgeries and learned even more. So, when I started, the team around me knew what to do.

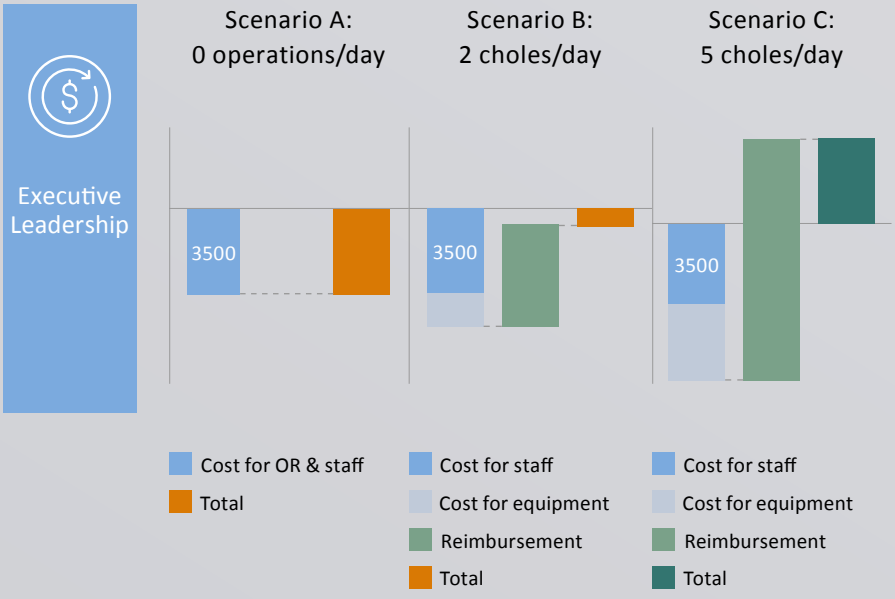
"The first-assist team and I standardized all the procedures," Lømo continued, "so that I do the same steps every time. And they know exactly what I'm going to do. Now, when I have one of the experienced first assists, I don't really have to say anything. They know exactly what I'm doing at any time, and they're almost always a half a step in front of me."

Vendor collaboration

The final ingredient in Hamar's success is its engagement with Intuitive's ecosystem of systems, learning, and services through multiple contact points. It must be said that Espen Martinussen, Intuitive's senior clinical sales representative for Norway, has been with Hamar from the start and has supported the team ever since. That's certainly been an advantage that the Hamar team points out, but all customers have easy access to services like the Genesis program, as well as the tools and data Intuitive provides to help them succeed.

Intuitive's Genesis consulting service supported Hamar in developing the protocols and refining processes to increase surgical volume. Genesis is offered to Intuitive customers and brings more than a decade of knowledge and best practices gained through working with more than 2,000 hospitals worldwide. Through observation and data analysis, Genesis helps hospitals optimize scheduling, address staffing challenges, and streamline workflows within and outside the OR. In its most recent engagement with Hamar, the Genesis team provided suggestions that enabled the team to move from three to five cholecystectomies per day and reduce costs by adopting a solution used by several U.S. hospitals—using lower-cost instruments and moving from using four da Vinci arms to three.

Every OR has a baseline cost – do you know yours?

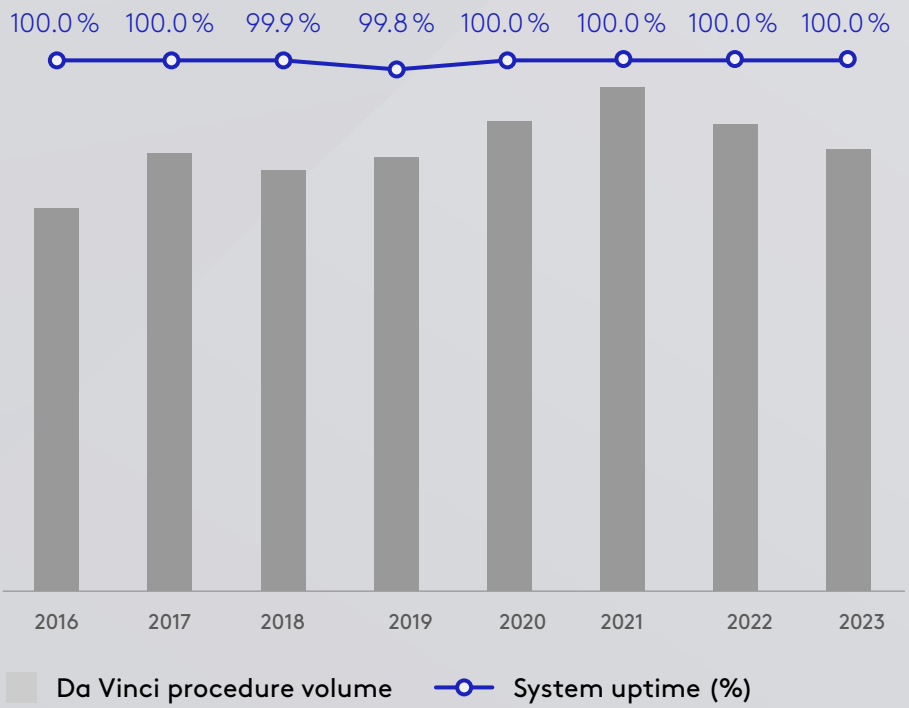


Source: Innlandet Hospital Trust Note:
Example excludes capital & services costs.
Exchange rate: 1NOK=0,08655€
(90day Avg. Aug 28th 2023)

System uptime is especially important for a high-volume hospital in a somewhat remote region known for its harsh winters. Through Intuitive's OnSite monitoring to detect potential issues, on-demand technical support, an inventory of spare parts, and a field engineer ready to deploy when needed, Hamar's X and Xi systems have achieved a 99% uptime. And in the last three years, both systems have reached an impressive 100% uptime.

Another way the company supported Hamar's program growth is by enabling the hospital to acquire the da Vinci X system through an operational lease. As a government-owned hospital, Hamar didn't have the money to purchase a new system, and financial leasing is considered the same as buying under Norwegian accounting standards. An operational lease allowed them to bring in the da Vinci X while also making it easy to upgrade when new technology becomes available.

System uptime – Hamar Xi system



System uptime – Hamar X system

Source: Intuitive data on file

"The future of surgery is minimally invasive, no doubt about it," said Christiansen. "Patients will demand it, and we want to perform it robotically because it's better for patients. And standing for hours with a bent neck is bad for surgeons."

Looking to the future

Hamar is already at the leading edge of the minimally invasive movement, so most of the team agrees that the future means doing more of the same, only better. Surgeons and executives are also exploring expansion into more emergent cases, different benign surgeries, and extended-hours access.

"You need to know your data and use it to get better. You can always get a bit better every single day, said Rekkedal. "And that's really important."

Like most hospitals, Hamar faces staffing challenges it must overcome to expand the program. "We have to keep on the efficiency," added Kydland. "We have to be efficient, and we need a team that's large enough to do the job. This hospital has soul and passion. There's trust among team members—they like working with each other. And as a team, we're proud of what we're doing. We have the two da Vinci systems and a team that strives for the best, which I hope will help us recruit more surgeons and nurses who share those values."

Disclosures
The Innlandet Hamar Hospital has received compensation from Intuitive for consulting services.

This material has been developed with, reviewed and approved by independent individuals who are not Intuitive employees.

Testimonials are based on unique experiences from current customers.

Da Vinci X and Xi Surgical Systems
The Intuitive Surgical Endoscopic Instrument Control Systems (da Vinci X and da Vinci Xi Surgical Systems) are intended to assist in the accurate control of Intuitive Surgical Endoscopic Instruments during urologic surgical procedures, general laparoscopic surgical procedures, gynecologic laparoscopic surgical procedures, general thoracoscopic surgical procedures, and trans-oralotolaryngology surgical procedures restricted to benign tumors and malignant tumors classified as T1 and T2, and for benign base of tongue resection procedures. The systems are indicated for adult and pediatric use (except for trans-oral otolaryngology surgical procedures). They are intended to be used by trained physicians in an operating room environment.

The da Vinci X and da Vinci Xi Surgical Systems are class IIb medical devices CE marked (CE2460) under the European Medical Devices

Directive (93/42/EEC), manufactured by Intuitive Surgical, Inc. Refer to Instructions For Use before use.

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