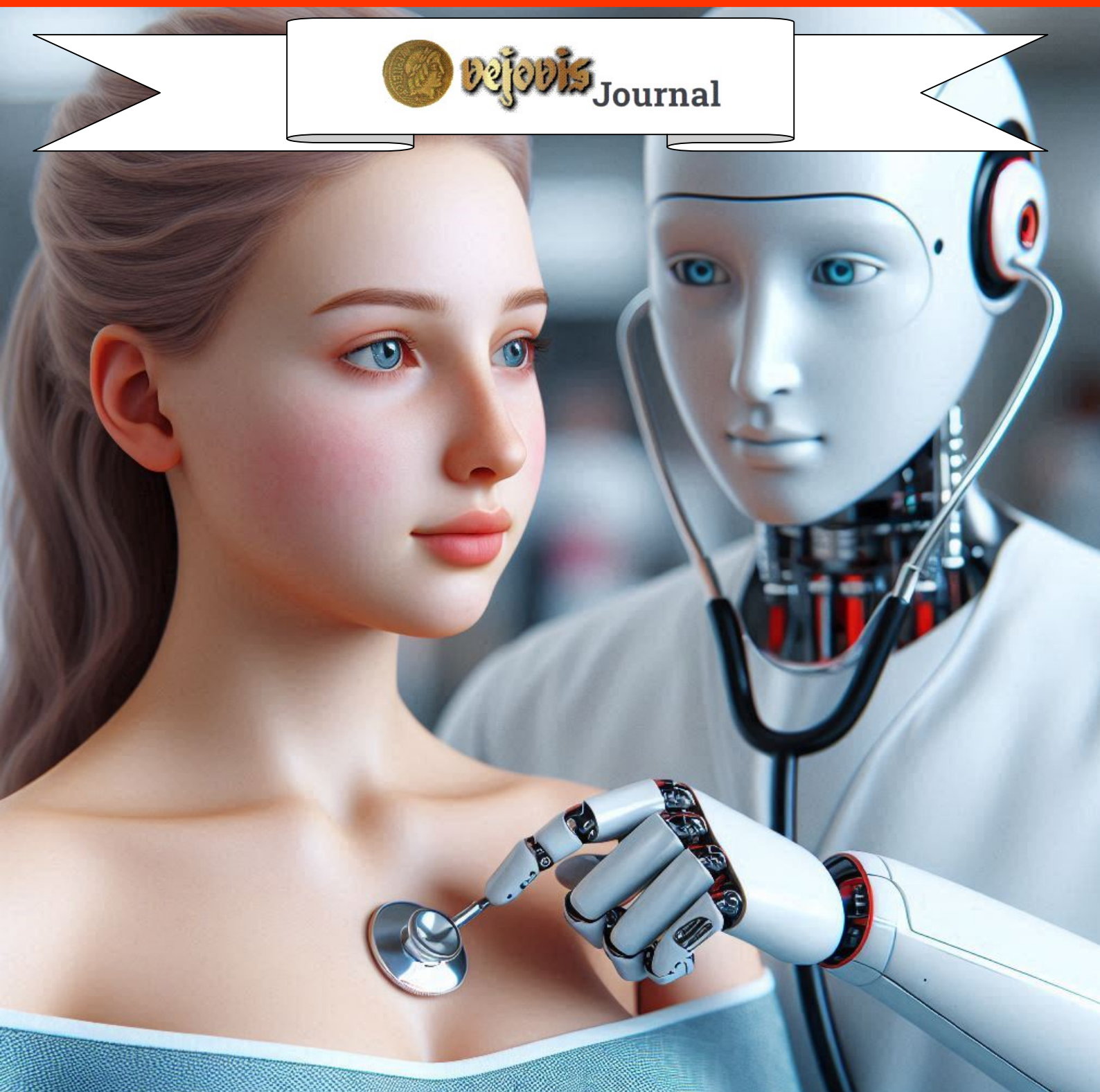


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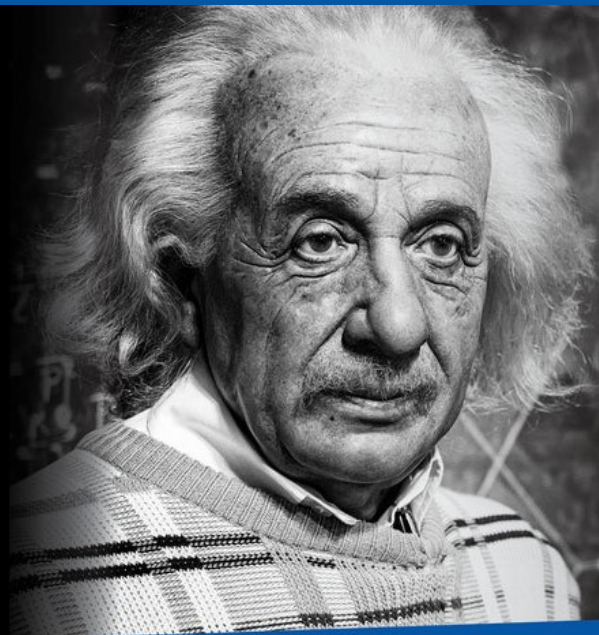
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**“Future Medicine  
will be the Medicine  
of Frequencies”**

*~ Albert Einstein*

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## **The Future of Doctors in the Age of AI: A New Era of Medicine**

By Giuseppe Strano, Editorial Director

### **Editorial**

In an age where technology is rapidly reshaping every sector, one field stands at the precipice of monumental change—medicine. Artificial Intelligence (AI) has already begun to make a significant impact, but the future promises a profound transformation in the way we approach healthcare. As we witness the rise of AI-powered tools, algorithms, and predictive models, the question that arises is: What is the future for doctors? Will AI replace physicians, or will it become an invaluable partner in the healthcare system?

As the Editorial Director of this publication, I've had the opportunity to explore many facets of how AI is revolutionizing medicine. This editorial aims to explore the evolving relationship between AI and the medical profession, its potential to enhance healthcare delivery, and what this means for the role of doctors in the future.

### **The Intersection of AI and Medicine**

The intersection between AI and medicine is not a far-off future concept. It is a current reality. In fact, AI has already begun to assist doctors in a wide range of areas, from diagnostics to drug development and personalized treatments. AI-powered tools such as machine learning models, natural language processing algorithms, and deep learning networks are increasingly being integrated into clinical practice.

AI has the ability to process massive amounts of data far more quickly than the human brain can. This data includes medical imaging, patient records, and clinical trials, which can be analyzed to identify patterns, suggest diagnoses, and recommend treatments. What would traditionally take hours or even days of analysis by a doctor can now be accomplished in minutes. This efficiency has the potential to save lives, increase productivity, and reduce human error in the process.

Moreover, AI is facilitating the development of precision medicine. By analyzing genetic data, environmental factors, and lifestyle choices, AI can help tailor treatments to individual patients. This shift from a one-size-fits-all approach to personalized medicine holds great promise for improving patient outcomes and enhancing the overall quality of care.

### **The Role of Doctors in the AI-Driven Healthcare System**

Despite the many capabilities of AI, it is unlikely that machines will ever fully replace human doctors. Rather, AI will serve as a tool—an extension of the doctor's expertise. While AI is exceptional at handling large datasets, recognizing patterns, and performing routine tasks, it still lacks the nuances of human judgment, empathy, and the ability to navigate complex ethical decisions.

Doctors have a unique ability to consider the entire context of a patient's life—physical, emotional, social, and psychological factors—when making decisions. They provide empathy, comfort, and an understanding that machines simply cannot replicate. The human element of medicine, especially in moments of crisis, remains irreplaceable.

That said, AI has the potential to drastically change how doctors work and how they interact with patients. The traditional role of the doctor as the sole decision-maker is evolving into a more collaborative relationship between humans and machines. AI can assist doctors by providing insights, improving diagnostic accuracy, and offering treatment suggestions, but the final decisions will still rest with the doctor.

Doctors will increasingly work alongside AI to focus on tasks that require critical thinking, creativity, and human compassion. AI will handle the heavy lifting of data analysis, freeing doctors to focus on patient care, communication, and ethical considerations. This will likely lead to greater efficiency in healthcare settings and a reduction in physician burnout—one of the most pressing issues in modern medicine.

### **AI in Diagnostics: Enhancing Accuracy and Efficiency**

AI's impact is perhaps most evident in the realm of diagnostics. Diagnostic errors remain a significant challenge in healthcare, contributing to patient harm and even fatalities. AI-powered diagnostic tools are helping to mitigate these errors

by improving the speed and accuracy with which conditions are detected.

For example, AI systems have been trained to analyze medical images such as X-rays, MRIs, and CT scans, outperforming human doctors in some cases. Algorithms can identify subtle abnormalities that may be missed by the human eye, leading to earlier detection of diseases such as cancer, cardiovascular conditions, and neurological disorders.

The introduction of AI-based diagnostic tools has the potential to increase the accuracy of diagnoses and reduce human error. These tools are designed to learn from vast datasets and continually improve their predictions over time, making them more reliable with each use. Additionally, AI has the capacity to analyze data across multiple sources, including medical history, genetic information, and lifestyle factors, to provide a more comprehensive picture of a patient's health.

In this context, doctors will need to embrace AI as a supplementary tool, one that can augment their ability to diagnose conditions and provide personalized care. Rather than replacing physicians, AI will enhance their capabilities, ensuring that patients receive more accurate diagnoses and better treatment plans.

## **AI in Treatment and Personalized Medicine**

While diagnostic capabilities are a major area of AI innovation, the potential for AI in treatment and personalized medicine is equally promising. Traditional medical treatments often follow a one-size-fits-all approach, where drugs or therapies are prescribed based on broad population-level data. However, we know that patients are unique, and treatments that work for one person may not work for another.

AI is poised to usher in an era of precision medicine, where treatment plans are tailored to the individual. By analyzing vast datasets—including genetic information, clinical history, and lifestyle factors—AI can help doctors design more effective, personalized treatment plans for patients.

In oncology, for example, AI algorithms can analyze a patient's genetic makeup and suggest targeted therapies that have the highest likelihood of success based on their unique biology. This personalized approach has the potential to revolutionize cancer treatment by increasing the chances of remission and reducing the risk of harmful side effects.

Additionally, AI can aid in drug discovery by predicting how different compounds

will interact with the body, identifying potential side effects, and even suggesting new drug candidates. AI can significantly speed up the development process, potentially bringing life-saving drugs to market more quickly and at lower costs.

For doctors, this means that they will increasingly rely on AI to identify the most appropriate treatment options for their patients. However, they will still play a crucial role in interpreting the results, making final decisions, and providing the compassionate care that patients need throughout the treatment process.

### **The Ethical Implications of AI in Medicine**

As with any technological advancement, the integration of AI into medicine raises important ethical questions. The use of AI in healthcare involves a delicate balance between innovation and responsibility. Issues related to data privacy, algorithmic bias, and the role of human judgment are at the forefront of discussions about AI in medicine.

One of the most pressing concerns is the use of patient data to train AI models. AI systems require vast amounts of data to learn and make predictions. While this data can improve diagnostic accuracy and

treatment outcomes, it also raises concerns about privacy and the potential for misuse. How can we ensure that patient data is protected, and that AI models are transparent in how they use this information?

Another concern is the potential for algorithmic bias. AI systems are only as good as the data they are trained on. If the data is biased or unrepresentative of diverse populations, AI systems may perpetuate or even exacerbate existing disparities in healthcare. Ensuring that AI models are trained on diverse, inclusive datasets is critical to mitigating this risk.

Finally, there is the issue of accountability. When an AI system makes a mistake or offers a faulty recommendation, who is responsible? Is it the doctor who relied on the AI's input, or the developers who created the system? As AI becomes more integrated into clinical decision-making, the lines between human and machine responsibility may blur, and clear frameworks for accountability will need to be established.

These ethical concerns will require careful thought and regulation, and doctors will need to work alongside ethicists, policymakers, and technologists to ensure



that AI is used in a way that prioritizes patient safety, equity, and fairness.

### **Education and Training for the AI-Enhanced Doctor**

For doctors to thrive in this new AI-enhanced healthcare landscape, they will need to acquire new skills and adapt their training to include a deeper understanding of AI and its applications in medicine. This means that medical schools and residency programs will need to incorporate AI-focused curricula into their training. Medical students will need to learn how to work with AI tools, interpret the results, and use them to inform clinical decision-making.

In addition to technical knowledge, doctors will need to develop strong interdisciplinary skills. The successful integration of AI into healthcare will require collaboration between doctors, data scientists, engineers, and ethicists. Physicians will need to be comfortable navigating these partnerships and communicating effectively with experts in fields outside of medicine.

Furthermore, the future doctor will also need to develop a high level of digital literacy. This will include an understanding of the algorithms behind the AI tools they use, the limitations of these

tools, and how to ensure that their use adheres to ethical and regulatory guidelines.

### **The Future Doctor: A Partnership Between Humans and Machines**

In conclusion, the future of doctors in the age of AI is not one of replacement but of transformation. Rather than taking over the role of the physician, AI will enhance and complement the work of doctors, enabling them to provide better, faster, and more personalized care. AI will take over routine tasks, process vast amounts of data, and offer insights that will inform clinical decisions. But the doctor's role will remain irreplaceable.

Doctors will continue to be the human touch in medicine—providing empathy, understanding, and judgment. They will work alongside AI to make decisions that are informed by data, but ultimately, they will remain the ones to navigate the complexities of patient care.

As we move into this new era, it is clear that the future of medicine will be a partnership between humans and machines—one where AI and doctors work hand-in-hand to improve patient outcomes and shape the future of healthcare.

The question, then, is not whether AI will replace doctors, but how doctors can harness the power of AI to create a healthcare system that is more efficient, more personalized, and ultimately more compassionate. The future is bright, and it is one where technology and humanity coexist to create a better, healthier world.

Giuseppe Strano

*Editor-in-Chief*

*VejoVis Journal*

## Robotic and laparoscopic Ileocolic resection for Crohn's disease: our initial experience

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### Abstract

**Introduction:** Robotic ileocolic resection has emerged as a promising surgical technique for the management of Chron's disease, particularly in cases involving the terminal ileum and proximal colon. This minimally invasive approach offers several potential benefits over traditional open and laparoscopic surgeries, including shorter recovery period and possibility to perform an intracorporeal anastomosis. We present our initial experience with a comprehensive analysis of the outcomes, advantages with robotic ileocolic resection for Chron's disease.

**Materials and methods:** We analyzed the short-term outcomes of ileocolic resection for Crohn's disease between robotic ileocolic resection with intracorporeal anastomosis and laparoscopic resection. Our first 10 patients undergoing minimally invasive ileocolic resections for Crohn's

disease, between January 2022 and May 2024, were retrospectively identified.

**Results:** Among the 10 patients, 5 (50%) underwent Robotic ileocolic resection while 5 (50%) Laparoscopic resection. Both groups were similar according to severity of disease and preoperative characteristics. Robotic resection was associated with longer operative time [Robotic resection:  $220 \pm 50$  min vs. Laparoscopic resection:  $120 \pm 59$  min. We had 1 anastomotic dehiscence in the robotic group. Return to bowel function was 2-3 days in both group and length of stays were similar, 4-5 days.

**Conclusions:** Robotic ileocecal resection demonstrated similar perioperative outcomes to laparoscopic resection, despite the longer operative time. Our robotic approach seems very favorable, Robotic surgery overcomes laparoscopic

pitfalls by providing steady-state three-dimensional visualization, augmented dexterity with endo-wrist movements, and superior ergonomics for the surgeon. Follow-up will be necessary to evaluate long-term results

### **Introduction:**

Crohn's disease (CD) is a chronic inflammatory bowel disease that can affect any part of the gastrointestinal tract, leading to a variety of debilitating symptoms and complications. Despite advancements in medical therapies, including the advent of biologic agents, many patients with Crohn's disease still require surgical intervention at some point during their disease course. Surgical treatment plays a crucial role not only in managing complications such as strictures, fistulas, and abscesses but also in improving the quality of life for patients who do not respond adequately to medical treatment.

The decision to perform surgery in Crohn's disease is complex and must be individualized, taking into consideration the extent and location of the disease, the patient's overall health, and previous

response to medical therapies. The primary goals of surgical intervention include resecting diseased segments of the bowel, preserving as much healthy bowel as possible, and preventing postoperative recurrence.

This manuscript aims to provide a comprehensive overview of the current surgical approaches for the management of Crohn's disease, including indications for surgery, preoperative considerations, surgical techniques, and postoperative care. We will also discuss recent advancements in surgical technology and techniques, such as minimally invasive and robotic surgery, which have significantly improved outcomes for patients undergoing surgery for Crohn's disease.

### **Materials and methods:**

We analyzed the short-term outcomes of ileocolic resection for Crohn's disease between robotic ileocolic resection with intracorporeal anastomosis and laparoscopic resection. Our first 10 patients undergoing minimally invasive ileocolic resections for Crohn's disease,

between January 2022 and May 2024, were retrospectively identified.

This retrospective study involved five patients diagnosed with Crohn's disease who underwent laparoscopic and robotic ileocolic resection between January 2022 and May 2024 at our Institution. The primary indications for surgery included symptomatic ileal or ileocolic strictures, failure of medical management, and the presence of fistulas or abscesses.

Patients were selected based on the following criteria:

1. Confirmed diagnosis of Crohn's disease through clinical, endoscopic, and histological evaluation.
2. Indications for surgical intervention due to complications or refractory disease.
3. No contraindications for laparoscopic surgery.
4. Informed consent obtained for the surgical procedure and inclusion in the study.

All patients underwent a thorough preoperative evaluation, including:

1. Comprehensive clinical examination.
2. Laboratory tests (complete blood count, electrolytes, liver function tests, and

inflammatory markers such as C-reactive protein).

3. Imaging studies (contrast-enhanced computed tomography or magnetic resonance enterography) to assess the extent of disease and identify any complications.

4. Endoscopic evaluation to confirm the location and severity of the disease.

#### Surgical Technique

Laparoscopic and robotic ileocolic resection was performed using the following standardized technique:

1. Under general anesthesia, patients were positioned in a modified lithotomy position.
2. The affected ileocolic segment was identified and mobilized robotically or laparoscopically.
3. The mesentery was divided using an energy device, and the ileocolic vessels were ligated.
4. The diseased bowel segment was resected, and an intracorporeal anastomosis was performed in the robotic group and an extracorporeal anastomosis in the laparoscopic group.

5. The specimen was extracted through a small incision, which was then closed in layers.

Postoperative management included:

1. Monitoring in the surgical ward with regular assessment of vital signs, pain control, and early mobilization.
2. Gradual resumption of oral intake, starting with clear liquids and advancing to a regular diet as tolerated.
3. Prophylactic antibiotics and anticoagulants administered as per hospital protocol.
4. Follow-up visits scheduled at 1 week, 1 month, and 3 months post-surgery to monitor recovery and detect any early complications.

Data collected included, disease characteristics, surgical details, operative time, intraoperative and postoperative complications, length of hospital stay, and postoperative recovery parameters.

**Results:**

Among the 10 patients, 5 (50%) underwent Laparoscopic ileocolic resection with intracorporeal anastomosis and 5 (50%) laparoscopic resection with extracorporeal anastomosis. Both groups were similar

according to baseline and preoperative characteristics. The robotic group was associated with and longer operative time [Robotic  $238 \pm 79$  min vs. Laparoscopic:  $143 \pm 52$  min;  $p < 0.001$ ]. We did not report 30-day postoperative complications Return to bowel function [Robotic:  $2.1 \pm 1.1$  vs. Laparoscopic:  $2.6 \pm 1.2$  days;  $p = 0.002$ ] and length of stay [Robotic:  $3.4 \pm 2.2$  vs. Laparoscopic:  $4.2 \pm 2.5$  days;  $p = 0.015$ ] were shorter in the Robotic group.

**Conclusion:**

This study provides a comparative analysis of laparoscopic and robotic ileocolic resection in the surgical management of Crohn's disease, examining outcomes in a cohort of ten patients. The results indicate that both surgical approaches are effective and safe, with each technique offering distinct advantages.

In the laparoscopic group, patients benefited from shorter operative times and reduced costs, making this approach a viable and efficient option for the treatment of Crohn's disease. The minimally invasive nature of the laparoscopic technique also contributed to reduced postoperative pain and quicker recovery times.

Conversely, the robotic group demonstrated superior precision and

flexibility, particularly in complex cases involving severe adhesions or anatomical challenges. The enhanced dexterity and three-dimensional visualization afforded by robotic surgery resulted in meticulous dissection and anastomosis, potentially reducing the risk of complications. Patients in the robotic group experienced comparable recovery times and postoperative outcomes to those in the laparoscopic group, suggesting that the robotic approach is equally efficacious.

Both groups exhibited similar rates of postoperative complications and hospital stays, indicating that the choice between laparoscopic and robotic techniques can be tailored to individual patient needs and surgeon expertise without compromising safety or efficacy.

In conclusion, laparoscopic and robotic ileocolic resection are both valuable surgical options for Crohn's disease. The selection of the appropriate technique should consider patient-specific factors, disease complexity, and available surgical expertise. Further studies with larger sample sizes and long-term follow-up are warranted to validate these findings and refine the selection criteria for each surgical approach.

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**Competing interests and conflict of interest:**

Authors declare no competing interests or conflict of interest.

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**Disclosure:**

Details were anonymised where possible, permission was granted for image use. Case report may be used for learning please cite.

**Keywords:** Anastomosis; Crohn disease; Ileocolic resection; Intracorporeal; Laparoscopy; Robotics.

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## **Piloting the Stratification of a Geriatric Intermediate Bed-Based Rehabilitation Service**

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### **Overview of the Rehabilitation and “Discharge to Assess” Pathway 2 services within the NHS**

Rehabilitation is defined as “a process of assessment, treatment and management by which the individual (and their family/carers) are supported to achieve their maximum potential for physical, cognitive, social and psychological function, participation in society and quality of living. Patient goals for rehabilitation vary according to the trajectory and stage of their condition.”. (British Society of Rehabilitation Medicine, 2019)

Following an acute hospital admission, there are various discharge pathways supported by the NHS, under the Discharge to Assess model (Appendix 1)(NHS England, 2015). Pathway 2 within the Discharge to Assess model, is the transfer of a patient from Acute Hospital to

Intermediate care-including Bed-Based Rehabilitation (BBICT) and Specialist Rehabilitation services (NHS England, 2015) . The National Institute of Clinical Excellence (NICE) outlines BBICT as a service that provides assessment and interventions in a bed-based setting, such as an acute hospital, community hospital, residential care home, nursing home, stand-alone intermediate care facility, independent sector facility, local authority facility or other bed-based setting. Bed-based intermediate care aims to prevent unnecessary admissions to acute hospitals and premature admissions to long-term care, and to support timely discharge from hospital. For most people, interventions last up to 6 weeks and are provided by a multidisciplinary team (NICE, 2017).

## **Mary Seacole Ward, Queen Mary's Hospital**

Mary Seacole Ward is a Geriatric bed-based rehabilitation service based at Queen Mary's Hospital in southwest London, as part of St. George's University Hospitals NHS Foundation Trust. The Unit has 42-beds, consisting of 6 single-sex 6-bed bays and 6 single side rooms, with access to a therapy gym and equipment outside of the ward setting. A team of nurses, health care assistants, physiotherapists, occupational therapists, therapy assistants, speech and language therapists, dieticians, pharmacists, doctors, social workers and volunteers work in partnership, to support patients to improve their ability to care for themselves, after an acute hospital stay. Following a short-term admission for inpatient rehabilitation on Mary Seacole Ward, patients can continue their rehabilitation under the community services, depending on their ongoing rehabilitation goals. (St Georges University NHS Foundation Trust, 2013).

Mary Seacole Ward is commissioned to provide a minimum of 3 therapy contacts a week with any therapy discipline, 24-hour nursing care and 1 medical contact a week with a Consultant Geriatrician, including a Complex Geriatric Assessment on admission. In addition to rehabilitation, the

Unit can provide ward-level medical care with access to oxygen therapy, intravenous fluids and intravenous medications, radiological investigations, if required. Resident doctors are present 9am-8pm on weekdays and 9am-5pm on weekends to provide medical input, with care overseen by the Consultant Geriatrician. As the Unit does not provide 24h on-site medical presence, nor level 2 monitoring, patients at acute risk of deterioration or in need of 24h medical input, may be transferred to the acute hospital, if this is within the patient's escalation plan.

## **Stratification of UK Rehabilitation Services**

The current stratification of the Pathway 2 services was developed during the COVID-19 Pandemic, according to the needs and complexity of patients within the services (NHS England, 2022)

Figure 1: Criteria to reside categories within Pathway 2 services (NHS England, 2022)

The UK Rehabilitation services are also classified as outlined by the (British Society of Rehabilitation Medicine, 2019) and (Appendix 5, NHS Commissioning Board, 2013) Figure 2:

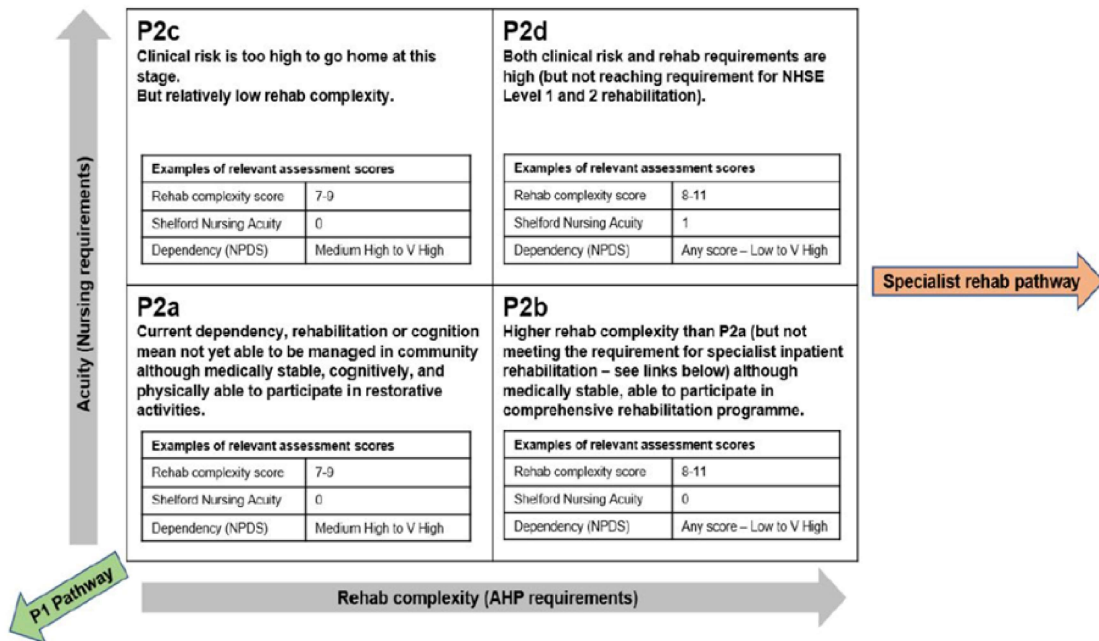


Figure 1

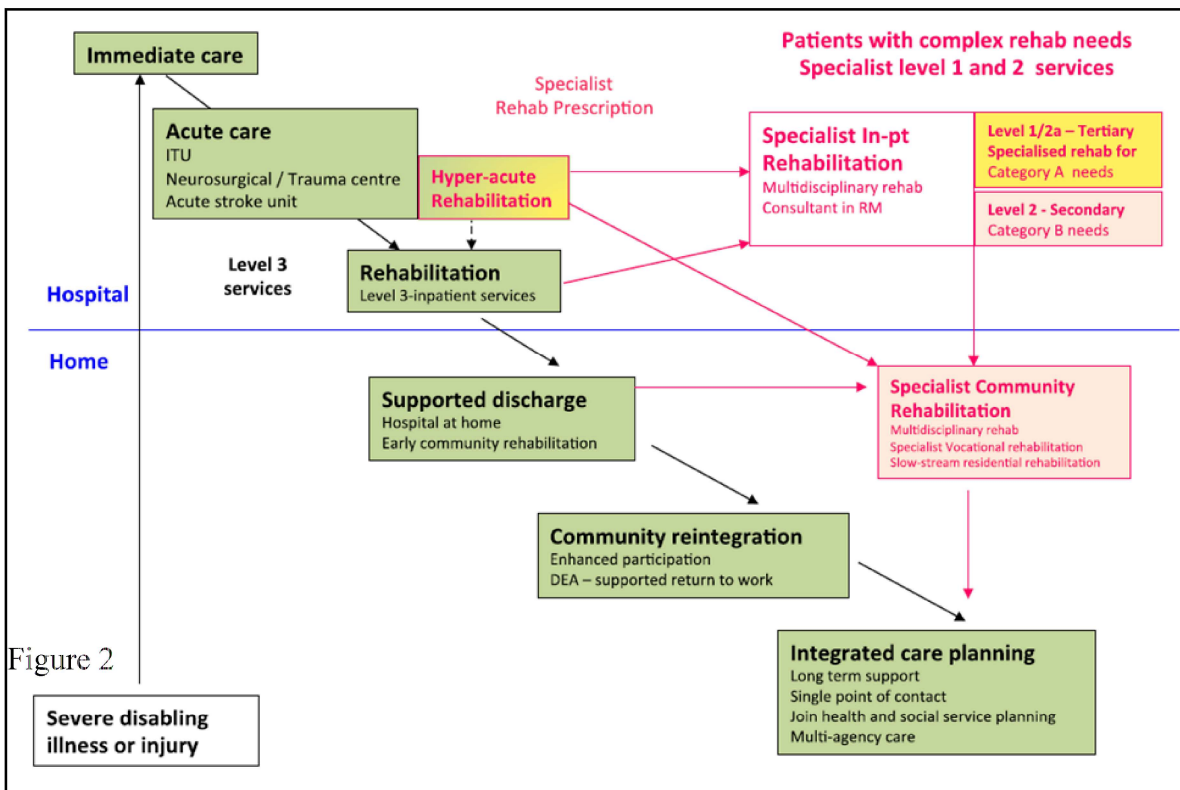


Figure 2

Figure 2

- UKROC Criteria: <sup>3</sup>70% of patients with RCS scores <sup>3</sup>11 cross-sectionally; <sup>3</sup>85% patients with Category A needs on admission.

Level 1: Tertiary ‘specialised’ rehabilitation services

- High cost / low volume services, which provide for patients with highly complex rehabilitation needs that are beyond the scope of their local and district specialist services.

Level 2: Local (district) specialist rehabilitation services

- Led or supported by a consultant trained and accredited in Rehabilitation medicine (RM), working both in hospital and the community setting.

- UKROC Criteria: Level 2a :50-70% of patients with RCS scores <sup>3</sup>11 cross-sectionally; 50-80% patients with Category A needs on admission; Level 2b: 30-50% of patients with RCS scores <sup>3</sup>11 cross-sectionally and Category A needs on admission

Level 3: Local non-specialist rehabilitation

- Teams provide general multi-professional rehabilitation and therapy support for a range of conditions within the context of acute services (including

stroke units), intermediate care or community services.

Hyper-acute Specialist Rehabilitation services

- Sited within acute care settings, when patients still have medical and surgical needs requiring continued active support from the trauma, neuroscience or acute medical services.

(British Society of Rehabilitation Medicine, 2019) ; (NHS Commissioning Board, 2013)

Stratification of patient groups is widely used within Level 1 and 2 specialist rehabilitation services, via the UKROC database, to both ensure the units are meeting the needs of their cohort and support the ongoing challenges between outcomes and cost-effectiveness. (Lynne Turner-Stokes, 2012) . (British Society of Rehabilitation Medicine, 2019) . The UKROC database collates data on needs, inputs and outcomes for all patients admitted to inpatient specialist rehabilitation services in England, using the Rehabilitation Complexity Scale (Appendix 2) and The Northwick Park nursing and therapy dependency tools (Appendix 4); in addition, it provides quarterly benchmarking reports on quality and cost–efficiency, comparing the

performance of each service with its peer group on key quality (British Society of Rehabilitation Medicine, 2019).

The Pathway 2 Model (figure 1), uses the Rehabilitation complexity scale (appendix 2), Northwick Park dependency scale (appendix 4) and the Shelford Safer Care Nursing tool (appendix 3) to stratify patient acuity and complexity. The Rehabilitation complexity scale (RCS) measures the complexity of needs for rehabilitation resources in terms of nursing care, medical support therapies, and specialist equipment (British Society of Rehabilitation Medicine, 2019). The Northwick Park Dependency Scale (NPDS) “provides an assessment of care and nursing needs in rehabilitation setting, which translates directly into an assessment of care hours and costs of providing care in the community” (Turner-Stokes). The Shelford Safer Nursing Care tool is used to measure patient acuity and/or dependency to inform optimum nursing staffing levels (NHS England, 2023).

This Pilot aims to apply existing stratification models to establish the service level provided at Mary Seacole Ward, in line with the NHS England Pathway 2 stratification model and to discuss the potential for using complexity

stratification within the Level 3 and Geriatric Rehabilitation services, to support adequate service provision.

## Methods

Stratification of the patient cohort on Mary Seacole Ward was Piloted for all inpatients during the month of September 2022.

The Rehabilitation Complexity Scale (RCS, Appendix 2) scoring model was used to quantify Patients’:

- Basic care and support needs [C0-4];
- Risk: Cognitive/Behavioural needs [R0-4];
- Skilled nursing needs [N0-4];
- Medical needs [M0-4];
- Therapy needs: Number of disciplines [TD0-4], Therapy intensity [TI0-4]
- Equipment needs [E0-2].

The RCS has a minimum score of 0 and a maximum score of 26.

The Shelford Group Safer Nursing Care Tool, 2013 (Appendix 3) was used to stratify the medical stability and dependence of patients on the Unit, ranging from:

- Level 0: Needs met by normal ward cares

- Level 1a: Acutely ill requiring intervention or unstable with a greater potential to deteriorate
- Level 1b: Stable but dependent on nursing care for most/all activities of daily living
- Level 2: May be managed within clearly designated beds with specific expertise
- Level 3: Needing advanced respiratory support +/- support of multiple organs

### Data Collection

Rehabilitation Complexity Scale (RCS) scores were collected for each inpatient on Mary Seacole Ward during the weekly multidisciplinary team (MDT) meetings for each half of the Unit, during September 2022, with each discipline providing scores for their respective category. In Week 1, data was only collected for the first half of the Unit. In Week 2 and Week 3 data was collected for both halves of the Unit at their respective MDT meetings. The RCS scores were recorded manually on printed copies of the version 13 proforma (Appendix 2) and filled out by the consultant leading the MDT meeting, these scores were then transcribed onto an excel spreadsheet for analysis.

The Shelford Levels are collated each shift by the Nurse in Charge as standard practice, the data for the day shift of each MDT meeting was extrapolated from the Unit's existing records. The NHS also acknowledges the Northwick Park Dependency Score (appendix 4) to support stratification of patients in the different pathways of care, this was not collected as part of the stratification pilot on Mary Seacole Ward. A total of 101 RCS scores were collected over a period of 5 MDT meetings across 3 weeks.

### Data Analysis

The Rehabilitation Complexity Scores (RCS) were recorded and analysed within the functions of Microsoft Excel. The scores were averaged as a total score and as the specialty components of the RCS (C, R, N, M, TD, TI, E) to explore the complexity of input needed in each category. The distribution of the number of patients with a respective RCS score was also outlined for each week.

RCS	C	R	N	M	TD	TI	E	Total	Min Score	Max Score
<b>Week 1</b> (N=21)	1.3	0.9	1.0	0.8	2.3	2.1	1.0	9.4	6	13
<b>Week 2</b> (N=39)	1.4	0.5	1.0	0.7	2.2	1.8	1.1	8.5	4	13
<b>Week 3</b> (N=41)	1.4	0.5	1.0	1.0	2.2	2.1	1.0	9.3	6	14

Chart 1: Total RCS scores distribution across all weeks of data collection

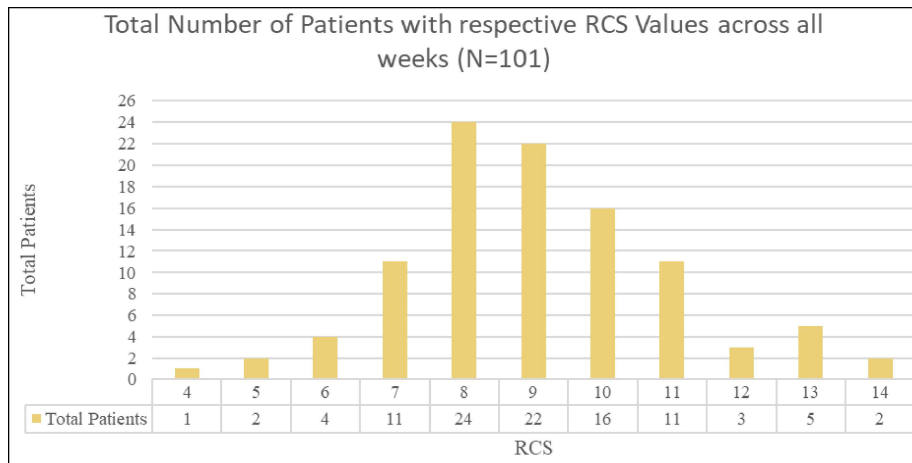
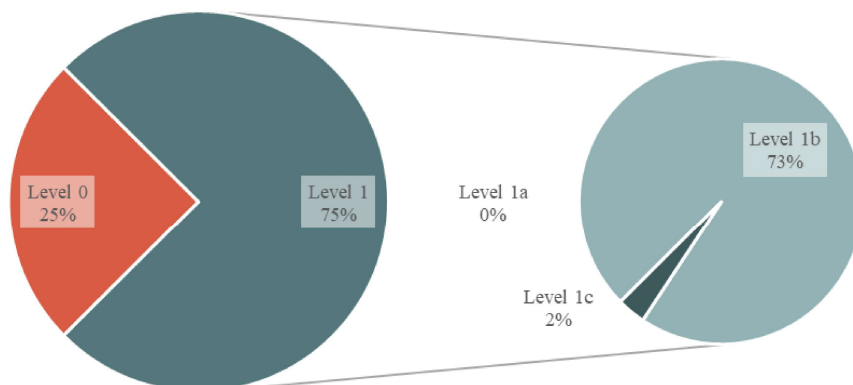


Chart 2: Distribution of Inpatient Shelford Levels for the day shift of RCS data

Distribution of Inpatient Shelford Nursing Levels across all Weeks



## Discussion

Using the (British Society of Rehabilitation Medicine, 2019) classification, Mary Seacole Ward meets the criteria of a non-specialised, Level 3 Rehabilitation Service, however, prior to this pilot, the service's classification within the Criteria to Reside Pathway 2 stratification (Figure 1, (NHS England, 2022) , was unclear.

Throughout the period of data collection, the cohort's RCS scores (N=101) range from 4-14. The average RCS score over the total 3 weeks was 8.7 (Chart 1). The Distribution of Shelford Nursing Scores across the 5 data collection days over 3 weeks are demonstrated in Chart 2, highlighting 75% of our patients had a Shelford Score of 1 on the days of data collection.

Using the Criteria to Reside pathway 2 stratification (Figure 1), 37% of patients had an RCS score <sup>3</sup>10, solely meeting the P2b or P2d criteria, depending on their Shelford nursing scores. 75% of our patients had a Shelford score of 1, exclusively meeting P2d criteria (provided their RCS score was also <sup>3</sup>8). 6.9% of patients had an RCS <7, below the complexity recommended for the pathway

2 services. We do not have the data to correlate each patients' RCS with their Shelford nursing score to generate the absolute numbers meeting each Criteria to Reside Pathway 2 categories, nor do we have the NPDS to support the differentiation between P2a/c with P2b/d. Within the limitations of our pilot, we can infer that most of our patients meet the P2d criteria: "Both clinical risk and rehab requirements are high (but not reaching requirement of NHSE Level 1 and 2 Rehabilitation)", due to the predominance of patients requiring Shelford level 1 nursing care.

Using the criteria outlined for the Specialist rehabilitation services (NHS Commissioning Board, 2013) , 20.8% of patients had an RCS score of <sup>3</sup>11, with the recommendation for the lower tier of specialised rehabilitation service (level 2b) criteria being 30-50% of patients with an RCS score <sup>3</sup>11 cross-sectionally, confirming the unit as a Level 3 service, however the full criteria for a Level 3 service is not as clearly defined.

Currently, Mary Seacole Ward uses the length of stay and number of readmissions to acute hospital as outcome measures, however this does not reflect the medical and rehabilitation complexity of the patient



cohort, nor provides outcome measures to assess progress in rehabilitation.

The specialist rehabilitation services use the UKROC database to stratify their cohort complexity and monitor their outcomes to review the quality and cost effectiveness of each service to support funding and commissioning (British Society of Rehabilitation Medicine, 2019). This data will have supported the clearly outlined criteria, minimum staffing provisions and quality standards, as outlined in the NHS contract for Level 1 and 2 specialised rehabilitation services (NHS Commissioning Board, 2013). The Non-specialised Level 3 Rehabilitation services could benefit from using a similar model, to support clear service standards and commissioning.

The service standards outlined for the specialist rehabilitation services are designed to meet the needs of patients, of all ages, with complex disability (NHS Commissioning Board, 2013). It is worth considering whether the Geriatric Rehabilitation services would benefit from a stratification tailored to adults living with frailty, it is unclear if the stratifications used by the specialist rehabilitation services would appropriately support this.

## Conclusion

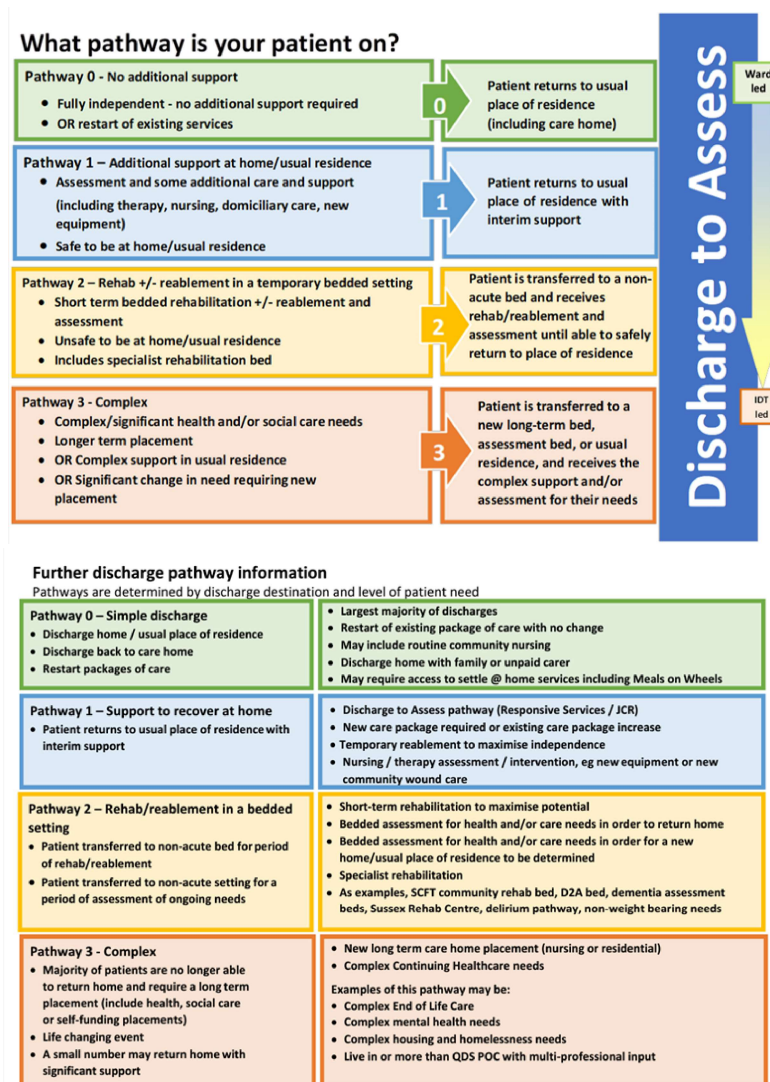
Collecting data on patients' complexity, needs and measurable outcomes can support the development of appropriate service standards and commissioning for a rehabilitation service, to ensure services are meeting the needs of their cohorts, as well as demonstrating cost-effectiveness (British Society of Rehabilitation Medicine, 2019) (Lynne Turner-Stokes, 2012). The level 3 rehabilitation services are not routinely required to measure the complexity of their patient cohorts in the same way as the specialised rehabilitation services.

This pilot has trialed the stratification of rehabilitation complexity for the patient cohort of Mary Seacole ward, a level 3 rehabilitation service, using the Pathway 2 model (figure 1) (NHS England, 2022). Within the limitations of this pilot, we have established the complexity of our cohort mostly meets the P2d classification of the Pathway 2 services (NHS England, 2022). Following this pilot, we would suggest trialing stratification, over a longer period and including the Northwick Park Dependency Score, to evaluate the service within the current outline of the UK Pathway 2, non-specialised rehabilitation services. With further studies, we would

aim to explore the role of stratification, to better understand the variety and needs of the level 3 rehabilitation services in the UK, to support improved outcomes and appropriate commissioning of non-specialised and Geriatric rehabilitation services.

## Appendix

### Appendix 1: Hospital Discharge Pathways 0, 1, 2, 3 Graphic (University Hospitals Sussex NHS Foundation Trust, 2020)



Appendix 2: Rehabilitation Complexity Score; RCS Version 13. Prof Lynne Turner-Stokes 05.04.2012

RCS Version 13. Prof Lynne Turner-Stokes 05.04.2012

## The Rehabilitation Complexity Scale: extended (version 13)

### Further instructions for application

<b>For each subscale, circle <u>highest level</u> applicable</b>	
<b>CARE or RISK</b> Describes the level of support the patient needs for either basic self care or to maintain their safety	
<b>NB: If not sure which to record, rate both CARE and RISK and use highest score</b>	
<b>BASIC CARE AND SUPPORT NEEDS</b> Includes assistance for basic care activities (either physical help or stand0by supervision) Includes washing, dressing, hygiene, toileting, feeding and nutrition, maintaining safety etc.	
<b>C 0</b>	<b>Largely independent.</b> Manages basic self-care tasks largely by themselves. May have incidental help just to set up or to complete – e.g. application of orthoses, tying laces etc
<b>C 1</b>	Requires <b>help from 1 person</b> for most basic care needs ie for washing, dressing, toileting etc. May have incidental help from a 2 <sup>nd</sup> person – e.g. just for one task such as bathing
<b>C 2</b>	Requires <b>help from 2 people</b> for the majority of their basic care needs
<b>C 3</b>	Requires <b>help from ≥3 people</b> for basic care needs
<b>C 4</b>	Requires constant <b>1:1 supervision</b> e.g. to manage confusion and maintain their safety
<b>RISK- COGNITIVE / BEHAVIOURAL NEEDS</b> (An alternative care primarily for 'walking wounded' patients who may be able to manage all/most of their own basic care, but there is some risk for safety eg due to confusion, impulsive behaviour or neuropsychiatric disturbance ) Includes supervision to maintaining safety or managing confusion eg in patients to have a tendency to wander, or managing psychiatric / mental health needs.	
<b>R 0</b>	<b>No risk – Able to maintain their own safety and to go out unescorted</b> Able to maintain their own safety at all times
<b>R 1</b>	<b>Low risk –</b> standard precautions only for safety monitoring within a structured environment But <b>requires escorting</b> outside the unit Maintains own safety within a structured environment, requiring only routine checks, but requires accompanying when outside the unit
<b>R 2</b>	<b>Medium risk – additional safety measures</b> OR managed under MHA section Additional safety measures even within a structured environment, eg alarms, tagging, or above standard monitoring (eg 1-2 hrly checks) OR managed under section of the Mental Health Act (time for additional paperwork etc)
<b>R 3</b>	<b>High risk –Frequent observations</b> (May also be managed under MHA section) Needs frequent observations even within a structured environment, eg ½ -1 hrly checks, or 1:1 supervision for part(s) of the day/night
<b>R 4</b>	<b>Very high risk -</b> Requires <b>constant 1:1 supervision</b> Needs 1:1 supervision all of the time

<b>SKILLED NURSING NEEDS</b>		
Describes the level of skilled nursing intervention from a qualified or specialist trained nurse		
<b>N 0</b>	No needs for skilled nursing – needs can be met by care assistants only	<b>Tick nursing disciplines required:</b>
<b>N 1</b>	Requires intervention from a <b>qualified nurse</b> (with general nursing skills and experience) e.g. medication, wound/stoma care, nursing obs, enteral feeding, setting up IV infusion etc)	General registered nursing
<b>N 2</b>	Requires intervention from <b>nursing staff who are trained and experienced in rehabilitation</b> e.g. for maintaining positioning programme, walking / standing practice, splint application, psychological support	Rehab-trained nurses Mental Health (RMN)
<b>N 3</b>	Requires <b>highly specialist nursing care</b> e.g. for very complex needs such as <ul style="list-style-type: none"> <li>• Management of tracheostomy Management of challenging behaviour / psychosis / complex psychological needs</li> <li>• Highly complex postural, cognitive or communication needs</li> <li>• Vegetative or minimally responsive states, locked-in syndromes</li> </ul>	Palliative care nursing Specialist neuro nurse (eg MS, PD, MND) Other
<b>N 4</b>	Requires <b>high dependency specialist nursing</b> (high level nursing skills and intensive input) eg medically unstable, requiring very frequent monitoring/ intervention by a qualified nurse - hourly or more often, (usually also specialist training eg IV drug administration or ventilation etc).	
<b>MEDICAL NEEDS</b>		
Describes the approximate level of medical care environment for medical/surgical management		
<b>M 0</b>	<b>No active medical intervention</b> - Could be managed by GP on basis of occasional visits)	<b>Tick medical interventions required:</b>
<b>M 1</b>	<b>Basic investigation / monitoring / treatment</b> (Requiring non-acute hospital care, could be delivered in a community hospital with day time medical cover) i.e. requires only routine blood tests / imaging. Medical monitoring can be managed through review by a junior medic x2-3 per week, with routine consultant ward-round + telephone advice if needed)	Blood tests Imaging (CT / MRI) Other Investigation State type.....
<b>M 2</b>	<b>Specialist medical / psychiatric intervention - for diagnosis or management/procedures</b> (Requiring in-patient hospital care in DGH or specialist hospital setting) i.e. requires more complex investigations, or specialist medical facilities e.g. dialysis, ventilatory support. Frequent or unpredictable needs for consultant input or specialist medical advice, surgical intervention , psychiatric evaluation/treatment.	Medication adjustment / monitoring Surgical procedure (eg tenotomy) State type.....
<b>M 3</b>	<b>Potentially unstable medical / psychiatric condition</b> - Requiring 24 hour on-site acute medical / psychiatric cover (depending on type of need) Potentially unstable: May require out-of hours intervention – e.g. for uncontrolled seizures, immuno-compromised condition, - or for psychiatric medical adjustment / emergency risk assessment etc) Needs to be managed in a setting where there is on-site 24 emergency medical /psychiatric cover.	Medical procedure (eg Botulinum toxin) State type..... Specialist opinion State discipline.....
<b>M 4</b>	<b>Acute medical / surgical problem (or psychiatric crisis)</b> Requiring emergency out-of-hours, intervention Requires acute medical/surgical care e.g. infection, acute complication, post surgical care. ie actual involvement of the 24 hour medical (or surgical or psychiatric) services, whether on a planned or unplanned basis	Medico-legal or capacity issues Other.....

**THERAPY NEEDS**  
 Describes the  
 a) number of different therapy disciplines required and  
 b) intensity of treatment  
 Includes individual or group-based session runs by therapists, but NOT rehabilitation input from nursing staff which is counted in N2.  
 (NB The Northwick Park Therapy Dependency Assessment (NPTDA) can be used to calculate total therapy hours in more complex cases e.g. and provide more detailed information regarding time for each discipline etc. It also includes quantitative information on the rehabilitation time provided by nursing staff)

**Therapy Disciplines: State number of different therapy disciplines required to be actively involved in treatment**

<b>TD 0</b>	<b>0</b> – no therapist involvement	<b>Tick therapy disciplines required:</b>		
<b>TD 1</b>	<b>1</b> discipline only	Physio	Psychology	Orthotics
<b>TD 2</b>	<b>2-3</b> disciplines	O/T	Counselling	Prosthetics
<b>TD 3</b>	<b>4-5</b> disciplines	SLT	Music/art therapy	Rehab Engineer
<b>TD 4</b>	<b>≥6</b> disciplines	Dietetics	Play therapy/school	Other:
		Social work	DEA/Jobcentre Plus	
		Other	Recreational therapy	
			Other	

**Therapy Intensity: State overall intensity of trained therapy intervention** required from team as a whole

<b>TI 0</b>	<b>No therapy intervention</b> (Or a total of <1 hour therapy input per week - Rehab needs are met by nursing/care staff or self-exercise programme)
<b>TI 1</b>	Low level – <b>less than daily</b> (eg assessment / review / maintenance / supervision) <b>OR Group therapy sessions only</b> (ie Patient does not receive therapy sessions every day ( or has <1 hour therapy per day) This usually means that a) they currently have mainly needs for care, nursing or medical treatment, or b) they are on a low intensity review only or group-based programme – or c) they are on a winding-down programme in preparation for discharge)
<b>TI 2</b>	Moderate – <b>daily intervention - individual sessions with one therapist</b> to treat for most sessions <b>OR very intensive Group programme</b> of ≥6 hours/day (ie Patient may have treatment from a number of different therapists (see TD), but is treated by one therapist at a time They will normally have therapy sessions every day 5 days a week, for a total of 2-3 hours per day (some of which may be periods of self-exercise under distant supervision if they are able) Or they have therapy in group based sessions on a very intensive basis (> 6 hours per day spent in group sessions)
<b>TI 3</b>	<b>High level – Daily intervention with therapist PLUS assistant and/or additional group sessions</b> Patient requires a second pair of hands for some treatment sessions, treatments ( eg physical handling) and so is treated by a therapist with an assistant ( who may be unqualified) OR they require an intensive programme ≥25 hours of total therapy time per week, (eg 4-5 hours per day 5 days per week) some of which may be sessions with a therapy assistant, or group-based sessions in addition to their individual daily therapy programme
<b>TI 4</b>	<b>Very High level – very intensive</b> (eg 2 trained therapists to treat, or total 1:1 therapy >30 hrs/week) Patient has very complex therapy needs requiring two trained therapists at a time (with or without a 3 <sup>rd</sup> assistant) – eg for complex physical handling needs, management of unwanted behaviours etc OR they require a very intensive programme involving > 30 hours of total therapy time per week.

**Total Total T score (TD + TI) :.....**

**EQUIPMENT NEEDS**  
 Describes the requirements for personal equipment

<b>E 0</b>	<b>No needs</b> for special equipment	Basic Special Equipment	Highly Specialist Equipment
<b>E 1</b>	Requires <b>basic special equipment</b> (off the shelf)	Wheelchair/seating Pressure cushion Special mattress Standing frame off-shelf orthotic Other.....	Environmental control Communication aid Customised seating Customised standing aid Customised orthotic Assisted Ventilation Other.....
<b>E 2</b>	Requires <b>highly specialist equipment</b> (eg Electronic assistive technology or highly customized equipment that is made or adapted specifically for that individual)		

Appendix 3: Shelford Safer Nursing Care Tool, 2013

Shelford Group Safer Nursing Care Tool		
Levels of Care	Patient Description	Example
<b>Level 0</b>	Needs met by provision of normal ward cares	Patient awaiting discharge
<b>Level 1a</b>	Acutely ill, requiring intervention or unstable with a greater potential to deteriorate	Post-operative care following complex surgery
<b>Level 1b</b>	In stable condition but dependant on nursing care to meet most/all of activities of daily living	Complex wound management
<b>Level 2</b>	May be managed within clearly designated beds, with required expertise; may require transfer to dedicated Level 2 facility/units	Continuous cardiac monitoring
<b>Level 3</b>	Needing advanced respiratory support and/or therapeutic support of multiple organs	Monitoring for compromised or collapse of two or more organs

Source: The Shelford Group Safer Nursing Care Tool, Shelford Chief Nurse Group Produced in conjunction with the Association of UK University Hospitals May 2013

Appendix 4: Northwick Park Dependency Score; July 2016

**NORTHWICK PARK DEPENDENCY SCORE – H (NPDS-H)**

PATIENT DETAILS: Surname: ..... Forename(s): .....  
 Hosp No: ..... Sex: Male/Female Date of birth:.....  
 NHS No.....Diagnosis:.....  
 Date of assessment..... Completed by: CRM, Other Medic,  
 Band 8, Band 7, Band 6, Other Band.....

FOR EACH ITEM, CIRCLE THE HIGHEST SCORE THAT APPLIES and answer any additional questions

**SECTION 1. BASIC CARE NEEDS**

**1. MOBILITY**  
 (Give most usual method of mobility around bay (hospital) or indoors (home))

Description	Dependency
a) Walks fully independently	0
b) Independent in Electric / self-propelled chair	1
c) Walks with assistance / supervision of one	2
d) Uses attendant-operated wheelchair	3
e) Bed-bound (unable to sit in wheelchair)	4
f) Walks with assistance / supervision of two	4

**2. BED TRANSFERS**

Description	Dependency
a) Fully independent	0
b) Requires help from one person	1
c) Requires help from two people	2
d) Requires hoisting by 1, and takes <½ hr* or	3
e) Requires hoisting by 2, and takes <¼hr	3
f) Bed bound	0

**2.1. FREQUENCY OF BED TRANSFERS**  
 If he/she needs help/supervision to transfer on/off bed

How many times do they get back to bed for a rest during the day?

0  1  2  More than 2

\*Note: It is very rare to hoist with one person, but occasionally happens when family members are in the home setting

**3. TOILETING BLADDER**

**3.1. MODE OF EMPTYING**  
 Which of the following does the patient use to empty their bladder?

By DAY		By NIGHT
<input type="checkbox"/>	Toilet	<input type="checkbox"/>
<input type="checkbox"/>	Commode	<input type="checkbox"/>
<input type="checkbox"/>	Bottles	<input type="checkbox"/>
<input type="checkbox"/>	Catheter / convene	<input type="checkbox"/>
<input type="checkbox"/>	Bed-pan	<input type="checkbox"/>
<input type="checkbox"/>	Pads	<input type="checkbox"/>

**3.2. NEED FOR ASSISTANCE**  
 (includes getting there, transferring onto toilet, cleaning themselves/changing and disposing of soiled pads, adjusting clothing, and washing hands afterwards.  
 IF USING BOTTLE: includes reaching for it, positioning and replacing it unspilt)

Description	Dependency
a) Able to empty their bladder independently	0
b) Set-up only (eg copes if bottles left within reach) or	1
c) Has indwelling catheter/ convene	1
d) Needs help/supervision from 1, and takes less than ¼hr	2
e) Needs help from 1, and takes more than ¼hr	3
f) Needs help from 2, and takes less than ¼hr	4

**3.3. FREQUENCY OF ASSISTANCE FOR EMPTYING BLADDER**  
 If he/she needs help to pass urine

How many times do they pass urine during the day (7am-11pm)?  
 up to 4 times  5-6 times  >6 times  Help at night only

How many times do they pass urine during the night (11pm-7am)?  
 0  1  2  >2

**3.4. URINARY ACCIDENTS**  
 A urinary accident is the need to change soiled clothing or bed/chair linen. If pads are used as the mode of bladder emptying but urine does not leak outside of these then accidents do not occur

Description	Dependency
a) No accidents or leakage from catheter / convene	0
b) Occasional accidents (Less than daily)	1
c) 1-2 accidents / leakage in 24 hrs	2
d) >2 accidents / leakage in 24 hrs	3

If scored 1: How many times per week? 1 2 3 4 5 6  
 If scored 3: How many times in 24 hrs? 3 4 5 6

1

<p><b>4. TOILETING BOWELS</b></p> <p><b>4.1. NEED FOR ASSISTANCE</b> (Includes getting to and transferring onto toilet, cleaning themselves/changing and disposing of soiled pads, adjusting clothing, and washing hands afterwards. IF HAS COLOSTOMY, includes emptying / changing bag hygienically)</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Description</th> <th>Dependency</th> </tr> </thead> <tbody> <tr><td>a) Able to empty their bowels independently</td><td>0</td></tr> <tr><td>b) Set-up only (eg giving suppositories / enema)</td><td>1</td></tr> <tr><td>c) Needs help/supervision from 1, and takes less than ¼hr</td><td>2</td></tr> <tr><td>d) Needs help from 1, and takes more than ¼hr</td><td>3</td></tr> <tr><td>e) Needs help from 2, and takes less than ¼hr</td><td>4</td></tr> <tr><td>f) Needs help from 2, and takes more than ¼hr</td><td>5</td></tr> </tbody> </table> <p><b>4.2. FREQUENCY OF OPENING BOWELS</b> (or emptying Colostomy bag) OR TRIAL OF EVACUATION</p> <p><input type="checkbox"/> 2-3 times per week    <input type="checkbox"/> 4-5 times per week    <input type="checkbox"/> Once a day  <input type="checkbox"/> Twice a day    <input type="checkbox"/> &gt; twice a day</p> <p>(Do not include faecal incontinence here)</p> <p>What time/s of day do they normally open their bowels/ have trial of evacuation?</p> <p>Morning    Midmorning    Midday    Afternoon    Evening    Bedtime  <input type="checkbox"/> 07-10.30    <input type="checkbox"/> 10.30-12    <input type="checkbox"/> 12-2pm    <input type="checkbox"/> 2-6pm    <input type="checkbox"/> 6-9pm    <input type="checkbox"/> 9pm-11pm</p> <p><input type="checkbox"/> No specific time (Variable)</p> <p>How many times do they open their bowels at night (11pm-7am)?</p> <p><input type="checkbox"/> 0    <input type="checkbox"/> 1    <input type="checkbox"/> 2    <input type="checkbox"/> &gt;2</p> <p><b>4.3. FAECAL ACCIDENTS</b></p> <p>A faecal accident is the need to change soiled clothing or bed/chair linen due to faecal soiling. If pads are used as the mode of faecal toileting but faeces do not leak outside of the pad then accidents do not occur. If bowels are opened once following suppositories/enema onto a pad this is "requires regular bowel regime"</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Description</th> <th>Dependency</th> </tr> </thead> <tbody> <tr><td>a) No faecal accidents</td><td>0</td></tr> <tr><td>b) Requires regular bowel regimen - suppositories / enemas in order to remain continent</td><td>1</td></tr> <tr><td colspan="2"><i>Enter Section 4: Care Needs assessment Item No. 4a</i></td></tr> <tr><td>c) Occasional faecal accidents (less than daily)</td><td>2</td></tr> <tr><td>d) Regular faecal accidents</td><td>3</td></tr> </tbody> </table> <p>If scored 2: How many times per week?    1    2    3    4    5    6</p> <p>If scored 3: How many times in 24 hrs?    1    2    3    4    5    6</p>	Description	Dependency	a) Able to empty their bowels independently	0	b) Set-up only (eg giving suppositories / enema)	1	c) Needs help/supervision from 1, and takes less than ¼hr	2	d) Needs help from 1, and takes more than ¼hr	3	e) Needs help from 2, and takes less than ¼hr	4	f) Needs help from 2, and takes more than ¼hr	5	Description	Dependency	a) No faecal accidents	0	b) Requires regular bowel regimen - suppositories / enemas in order to remain continent	1	<i>Enter Section 4: Care Needs assessment Item No. 4a</i>		c) Occasional faecal accidents (less than daily)	2	d) Regular faecal accidents	3	<p>Patient Name..... NHS No:.....</p> <p><b>5. WASHING AND GROOMING</b> (Includes washing hands and face, cleaning teeth, brushing hair, and shaving or applying make-up) NB. This item does not include bathing / showering</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Description</th> <th>Dependency</th> </tr> </thead> <tbody> <tr><td>a) Able to wash and groom independently</td><td>0</td></tr> <tr><td>b) Needs help to set up only (eg laying out things, filling bowl with water)</td><td>1</td></tr> <tr><td>c) Needs help from 1, and takes less than ¼ hr</td><td>2</td></tr> <tr><td>d) Needs help from 1, and takes more than ¼ hr</td><td>3</td></tr> <tr><td>e) Needs help from 2, and takes less than ¼ hr</td><td>4</td></tr> <tr><td>f) Needs help from 2, and takes more than ¼ hr</td><td>5</td></tr> </tbody> </table> <p><b>Note:</b> It is very rare to need help from 2 to groom unless patient requires support to sit up or restraint or suctioning when teeth are cleaned.</p> <p><b>6. BATHING / SHOWERING</b> (Includes getting to bath/shower room, transferring in and out, washing and drying) NB. If unable to bath or shower. Complete as for THOROUGH STRIP WASH/BED BATH</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Description</th> <th>Dependency</th> </tr> </thead> <tbody> <tr><td>a) Able to have bath/shower independently</td><td>0</td></tr> <tr><td>b) Needs help to set up only (eg running bath soaping flannel etc)</td><td>1</td></tr> <tr><td>c) Needs help from 1, and takes less than ½ hr</td><td>2</td></tr> <tr><td>d) Needs help from 1, and takes more than ½ hr</td><td>3</td></tr> <tr><td>e) Needs help from 2, and takes less than ½ hr</td><td>4</td></tr> <tr><td>f) Needs help from 2, and takes more than ½ hr</td><td>5</td></tr> </tbody> </table> <p><b>7. DRESSING</b> (includes putting on shoes, socks, tying laces, putting on splint or orthosis)</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Description</th> <th>Dependency</th> </tr> </thead> <tbody> <tr><td>a) Able to dress independently</td><td>0</td></tr> <tr><td>b) Needs help to set up only (eg laying out clothes) or</td><td>1</td></tr> <tr><td>c) Needs incidental help from 1 (eg just with shoes)</td><td>1</td></tr> <tr><td>d) Needs help from 1, and takes less than ¼hr</td><td>2</td></tr> <tr><td>e) Needs help from 1, and takes more than ¼hr</td><td>3</td></tr> <tr><td>f) Needs help from 2, and takes less than ¼ hr</td><td>4</td></tr> <tr><td>g) Needs help from 2, and takes more than ¼ hr</td><td>5</td></tr> </tbody> </table>	Description	Dependency	a) Able to wash and groom independently	0	b) Needs help to set up only (eg laying out things, filling bowl with water)	1	c) Needs help from 1, and takes less than ¼ hr	2	d) Needs help from 1, and takes more than ¼ hr	3	e) Needs help from 2, and takes less than ¼ hr	4	f) Needs help from 2, and takes more than ¼ hr	5	Description	Dependency	a) Able to have bath/shower independently	0	b) Needs help to set up only (eg running bath soaping flannel etc)	1	c) Needs help from 1, and takes less than ½ hr	2	d) Needs help from 1, and takes more than ½ hr	3	e) Needs help from 2, and takes less than ½ hr	4	f) Needs help from 2, and takes more than ½ hr	5	Description	Dependency	a) Able to dress independently	0	b) Needs help to set up only (eg laying out clothes) or	1	c) Needs incidental help from 1 (eg just with shoes)	1	d) Needs help from 1, and takes less than ¼hr	2	e) Needs help from 1, and takes more than ¼hr	3	f) Needs help from 2, and takes less than ¼ hr	4	g) Needs help from 2, and takes more than ¼ hr	5
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a) Able to empty their bowels independently	0																																																																						
b) Set-up only (eg giving suppositories / enema)	1																																																																						
c) Needs help/supervision from 1, and takes less than ¼hr	2																																																																						
d) Needs help from 1, and takes more than ¼hr	3																																																																						
e) Needs help from 2, and takes less than ¼hr	4																																																																						
f) Needs help from 2, and takes more than ¼hr	5																																																																						
Description	Dependency																																																																						
a) No faecal accidents	0																																																																						
b) Requires regular bowel regimen - suppositories / enemas in order to remain continent	1																																																																						
<i>Enter Section 4: Care Needs assessment Item No. 4a</i>																																																																							
c) Occasional faecal accidents (less than daily)	2																																																																						
d) Regular faecal accidents	3																																																																						
Description	Dependency																																																																						
a) Able to wash and groom independently	0																																																																						
b) Needs help to set up only (eg laying out things, filling bowl with water)	1																																																																						
c) Needs help from 1, and takes less than ¼ hr	2																																																																						
d) Needs help from 1, and takes more than ¼ hr	3																																																																						
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f) Needs help from 2, and takes more than ¼ hr	5																																																																						
Description	Dependency																																																																						
a) Able to have bath/shower independently	0																																																																						
b) Needs help to set up only (eg running bath soaping flannel etc)	1																																																																						
c) Needs help from 1, and takes less than ½ hr	2																																																																						
d) Needs help from 1, and takes more than ½ hr	3																																																																						
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f) Needs help from 2, and takes more than ½ hr	5																																																																						
Description	Dependency																																																																						
a) Able to dress independently	0																																																																						
b) Needs help to set up only (eg laying out clothes) or	1																																																																						
c) Needs incidental help from 1 (eg just with shoes)	1																																																																						
d) Needs help from 1, and takes less than ¼hr	2																																																																						
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ENTERAL FEEDING</b> (GASTROSTOMY or NASOGASTRIC TUBE)</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Description</th> <th>Dependency</th> </tr> </thead> <tbody> <tr><td>a) No enteral feeding/ manage feeds independently</td><td>0</td></tr> <tr><td>b) Needs help to set up feed just once a day (indicate set up time)</td><td>1</td></tr> <tr><td>c) Needs help to set up feed twice a day (indicate set up times)</td><td>2</td></tr> <tr><td>d) Needs help to set up feed three times a day (indicate set up time)</td><td>3</td></tr> <tr><td>e) Needs help to set up feed and extra flushes during the day</td><td>4</td></tr> <tr><td>f) Needs help to set up feed and extra flushes both day and night</td><td>4</td></tr> </tbody> </table> <p>Time feeds set up <input type="checkbox"/> Morning    <input type="checkbox"/> Midday    <input type="checkbox"/> Evening    <input type="checkbox"/> Bedtime    <input type="checkbox"/> Night</p> <p><b>9. 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Patient Name.....	Hospital No: .....	NHS No:.....
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**SECTION 2: SPECIAL NURSING NEEDS**  
ADD 5 FOR EACH OF THE BELOW (if applicable)

Description	Dependency
1. Tracheostomy	5
2. Open pressure sore / wound requiring dressings	5
3. More than 2 interventions required at night	5
4. Pt or relatives need substantial psychological support	5
5. Infective isolation	5
6. Intercurrent medical / surgical problem	5
7. Needs one-to-one "specialing"	5

**NPDS TOTAL SCORES**

**SECTION 1: BASIC CARE NEEDS** .....

**SECTION 2: SPECIAL NURSING NEEDS** .....

**NPDS NURSING DEPENDENCY SCORE** .....

**SECTION 3: IN-PATIENT NURSING NEEDS**

Tick if applicable

	Yes	No
1. Maintenance of rehabilitation programme	<input type="checkbox"/>	<input type="checkbox"/>
2. Complex feeding needs (requires skilled carer)	<input type="checkbox"/>	<input type="checkbox"/>
3. Complex basic care needs (requires skilled carer)	<input type="checkbox"/>	<input type="checkbox"/>
4. Complex discharge needs	<input type="checkbox"/>	<input type="checkbox"/>
5. 3 or more people needed for basic care needs	<input type="checkbox"/>	<input type="checkbox"/>
6. Active teaching of self-catheterisation	<input type="checkbox"/>	<input type="checkbox"/>
7. Infective Isolation	<input type="checkbox"/>	<input type="checkbox"/>
8. More than 2 night interventions	<input type="checkbox"/>	<input type="checkbox"/>

**1. TRACHEOSTOMY MANAGEMENT**

Description	Dependency
a) No tracheostomy in situ / or self management	0
b) Maintenance tracheostomy intervention e.g changing inner tube, minimal suction <2 day	1
c) Active tracheostomy intervention e.g weaning, frequent suction 2-6 times a day	3
d) Maximal tracheostomy intervention e.g very frequent suction >6 per day or requires 2 people or very close monitoring	5

**2. WOUND DRESSING OR PROBLEMATIC STOMA DRESSINGS**

Description	Dependency
a) No wound dressing / self management	0
b) Simple dressing (does not require Qualified staff)	1
c) Simple dressing – requires qualified staff intervention	3
d) Complex – requires qualified staff intervention or 2 people	5

**3. MEDICATION (Including remembering to take it, opening bottles etc)**

a) No medication OR able to take all medication independently	0
b) Supervised practise – patient dispenses & takes medication under supervision	1
c) Nurse dispenses and administers all medication	2
d) Requires additional time from qualified staff	3

tick e.g  CD meds  IV meds  PEG meds  Supervised practice

How many times per day does any medication need to be given?

1	2	3	4	5	More than 5
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**4. PATIENT AND/OR FAMILY REQUIRE PSYCHOLOGICAL SUPPORT FROM NURSING/CARE STAFF**

a) No additional psychological support needed	0
b) Require frequent reassurance – can be provided by any care staff	1
c) Require psychological support from experienced nurse <2hours per week	3
d) Requires additional time from an experienced nurse >2 hrs/ week	5

4

Patient Name.....	Hospital No: .....	NHS No:.....
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**5. SERIAL/ RESTING SPLINTS**

Description	Dependency
a) No splints/able to apply own splints	0
b) Simple splint application (e.g Velcro splint) can be applied by one person, limb does not need prior stretching	1
c) Moderate splint application (e.g back slab and bandage) requiring application by 2 people (or 2 required due to behavioural issues)	2
d) Complex splint application (e.g bivalve and bandage) stretching of limb required prior to application and requires 2 to apply	3

**5.1. FREQUENCY OF SPLINT APPLICATION**

How frequently do they have their splint/s applied?

Daytime  Once  Twice  Three or more

Night time  Night splints

**6. POSTURAL MANAGEMENT (IN BED OR CHAIR)**

Description	Dependency
a) Able to maintain own posture	0
b) Needs prompting or help from one to maintain posture/position, 1-3 times in 24 hours	1
c) Needs prompting or help from 1 to maintain posture/position, 4 or more times in 24 hours	2
d) Needs help from 2 to maintain posture/position, 1-3 times in 24 hours	3
e) Needs help from 2 to maintain posture/position 4 or more times in 24 hours	4

**7. INTERCURRENT MEDICAL/SURGICAL PROBLEM**

Description	Dependency
a) No intercurrent medical/surgical problem	0
b) Requires daily monitoring of vital signs	1
c) Requires 4 hourly monitoring of vital signs or specific intervention by a qualified nurse for less than 2 hours a day	3
d) Requires specific intervention by a qualified nurse for more than 2 hours a day	5

**8. ONE TO ONE SPECIALING**

Description	Dependency
a) No one to one specialing required	0
b) Needs specialing (no specific skill needed)	1
c) Requires specialing by a nurse/skilled carer with rehabilitation experience	3
d) Requires specialing either by a speciality trained nurse (mentally unwell) or by a qualified nurse (acutely unwell)	5

**TIME SPECIALING REQUIRED**

Daytime only  Night time only  24 hours a day

**TOTAL NPDS-H SCORE**

**SECTION 1: BASIC NURSING NEEDS (65)** .....

**SECTION 3: IN PATIENT NURSING NEEDS (35)** .....

**TOTAL NPDS-H SCORE (Add section 1 + 3 only)** .....

**SECTION 4: CARE NEEDS ASSESSMENT**

**1. STAIRS (Based on if they were at home.)**

Would they be able to go up/down stairs at home?

a) Yes, without help (independent)

b) Yes, with assistance/supervision

c) No, unable to do stairs (stays on one level)

d) No, does not have stairs at home

**2. MAKING A SNACK / MEAL (at home)**

a) Not applicable as entirely gastrostomy fed	0
b) Able to make a snack and drink at home independently	0
c) Able to help themselves if a snack is left out in the kitchen	1
d) Needs meals or drinks putting in front of them	2

5



Patient Name.....	Hospital No:	NHS No:.....
<b>3. MEDICATION (Including remembering to take it, opening bottles etc)</b>		
a) Not applicable (eg on no medication)	0	
b) Able to take all medication independently	0	
c) Able to help themselves if tablets left out in the morning	1	
d) Requires help for medication to be given	2	
<b>If requires help, which times does medication need to be given?</b>		
<b>(Tick all that apply)</b>		
<input type="checkbox"/> 7am <input type="checkbox"/> 10am <input type="checkbox"/> Midday <input type="checkbox"/> 2pm <input type="checkbox"/> 4pm <input type="checkbox"/> 6pm <input type="checkbox"/> 8pm <input type="checkbox"/> 10pm <input type="checkbox"/> Other		
<b>4. Do they require skilled help from a NURSE or TRAINED CARER for any of the following tasks?</b>		
a) Suppositories / Enema	<input type="checkbox"/> Yes <input type="checkbox"/> No	
b) Stoma Care (Tracheostomy, gastrostomy etc)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
c) Pressure Sore / wound dressing	<input type="checkbox"/> Yes <input type="checkbox"/> No	
d) Special medication (eg insulin injections)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>If skilled help is required</b>		
<b>How many times a week?</b>	<b>Who provides that help?</b>	
Times per week	Family	Home Care
		Nurse
for Supps .....	<input type="checkbox"/>	<input type="checkbox"/>
Stoma care .....	<input type="checkbox"/>	<input type="checkbox"/>
Wound care .....	<input type="checkbox"/>	<input type="checkbox"/>
Special Medication.....	<input type="checkbox"/>	<input type="checkbox"/>
<b>5. Do they require help for DOMESTIC DUTIES? (Based on if they were at home)</b>		
a) Light housework	<input type="checkbox"/> Yes <input type="checkbox"/> No	
b) Heavy housework	<input type="checkbox"/> Yes <input type="checkbox"/> No	
c) Shopping	<input type="checkbox"/> Yes <input type="checkbox"/> No	
d) Laundry	<input type="checkbox"/> Yes <input type="checkbox"/> No	

6

### Appendix 5 NHS Commissioning Board 2013

<b>TERTIARY SPECIALISED REHABILITATION SERVICES- provided at regional / national level</b>		
<b>Level 1:</b>	<b>Specialised rehabilitation services</b> Provided by specialised rehab teams led by consultants trained and accredited in the specialty of rehabilitation medicine (RM) (and/or neuropsychiatry):	
	Serving a regional or supra-regional population and taking patients with Category A needs – ie severe physical, cognitive communicative disabilities or challenging behaviours, with highly complex rehabilitation needs* that are beyond the scope of their local specialist rehabilitation services, and have higher level facilities and skilled staff to support these. Collect and report full National Specialist Rehabilitation Dataset	Catchment: 1-3 million Predominantly highly complex caseload: At least 85% pts have Category A needs on admission At least 70% pts with RCS-E score ≥11 cross-sectionally
<b>LOCAL REHABILITATION SERVICES - provided at district level</b>		
<b>Level 2:</b>	<b>Local (district) specialist rehabilitation services</b> Provided by inter-disciplinary teams led/supported by a consultant in RM, and meeting the BSRM standards for specialist rehabilitation services	
Level 2a	Led by consultant in RM. Serving an extended local population in areas which have poor access to level 1 services. Take patients with a range of complexity, including Category B and some Category A with highly complex rehabilitation needs* Collect and report full National Specialist Rehabilitation Dataset	Catchment: 600K-1 million Mixed caseload 50-80% Category A needs on admission 50-70% RCS-E score ≥11 cross-sectionally
Level 2b	Led/supported by a consultant in RM. Serving a local population, predominantly patients with Category B needs. Collect and report at least the minimum national dataset	Catchment: 250-500K Less complex caseload eg 30-50 % Category A needs on admission 30-50% RCS-E score ≥11 cross-sectionally
<b>Level 3:</b>	<b>Local non-specialist services.</b> Includes generic rehabilitation for a wide range of conditions, provided in the context acute, intermediate care and community facilities, or other specialist services (eg stroke units)	
Level 3a	Other specialist services led or supported by consultants in specialties other than RM - eg services catering for patient in specific diagnostic groups (eg stroke) with Category C needs. Therapy / nursing teams have specialist expertise in the target condition	
Level 3b	Generic rehabilitation for a wide range of conditions, often led by non-medical staff, provided in the context acute, intermediate care and community facilities, for patients with Category D needs	

## Conflict of Interests

The authors' declare that there are no conflicts of interests.

## Acknowledgments: None

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**Keywords:** Rehabilitation for patient with highly complex needs, Geriatric Hospital Discharge, UKROC.

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Mary Seacole Ward, Queen Mary's Hospital, St Georges University Hospitals NHS Foundation Trust

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## Correlation Between Pelvic Congestion Syndrome (PCS) and Hemorrhoids: Investigation, Management, and Future Treatment Evolution

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### Abstract

Pelvic Congestion Syndrome (PCS) and hemorrhoids are two conditions linked to venous insufficiency, frequently coexisting due to their shared underlying vascular pathologies. This article reviews their correlation, diagnostic approaches, and current treatment options, with a focus on emerging therapies like radiofrequency and laser treatments. The future of treatment, guided by advancements in diagnostics and minimally invasive therapies, presents new opportunities for addressing these conditions effectively.

### Introduction

Both PCS and hemorrhoids stem from chronic venous insufficiency (CVI), leading to varicose veins within the pelvis and rectal areas. This shared pathophysiology has prompted investigations into their correlation, emphasizing the need for integrated

diagnostics and innovative treatments. By exploring their pathophysiological connections, optimal management approaches can be developed to improve patient outcomes.

### Correlation Between Pelvic Congestion Syndrome and Hemorrhoids

Research reveals that PCS and hemorrhoids often coexist, particularly in patients with chronic venous insufficiency in the lower body. This correlation arises as both conditions involve varicose veins PCS primarily within the pelvic area and hemorrhoids in the anorectal region [1,2].

### Shared Pathophysiology and Risk Factors

1. Anatomical and Vascular Variations: Studies indicate that specific anatomical variations and venous stasis within the pelvis increase susceptibility to both PCS

and hemorrhoids [3]. When pelvic veins become dilated, they can lead to blood pooling, which exacerbates pressure in the lower veins, contributing to hemorrhoidal varicosities.

2. Hormonal Influences: Estrogen's role in vein wall relaxation and dilation has been shown to impact both PCS and hemorrhoids, with higher incidence rates in women, particularly during hormonal shifts in pregnancy [4]. Hormone therapy or contraceptive use has also been linked to increased venous dilation in predisposed individuals, further connecting the two conditions [5].

3. Pregnancy and Childbirth: Pregnancy increases the risk of PCS and hemorrhoids due to the increased pelvic pressure and blood volume, as well as hormone-induced vein dilation. Studies show that women with multiple pregnancies are especially prone to chronic pelvic venous issues [6].

4. Lifestyle Factors: Lifestyle factors like prolonged sitting, sedentary behavior, obesity, and physical strain contribute to PCS and hemorrhoidal development. Increased intra-abdominal pressure from these factors promotes venous congestion in the pelvis and rectum, exacerbating both conditions [7,8].

## **Investigative Techniques for PCS and Hemorrhoids**

Diagnostic accuracy is crucial for effective management. Non-invasive techniques like ultrasound and MRI, as well as invasive procedures when necessary, provide comprehensive views of the pelvic and rectal venous systems.

### **Doppler Ultrasound and Transvaginal Ultrasound**

Doppler ultrasound is often the first-line diagnostic tool for evaluating PCS, allowing real-time visualization of blood flow abnormalities in pelvic veins. Transvaginal ultrasound can offer more precise imaging of the pelvic venous system, aiding in the detection of varicosities and valve insufficiencies linked to PCS and, indirectly, to hemorrhoidal issues [9].

### **Magnetic Resonance Imaging (MRI)**

MRI is increasingly used to visualize pelvic vein dilation and congestion accurately. In PCS, MRI can reveal enlarged pelvic veins and varicosities, while for hemorrhoids, it assists in assessing the extent of rectal and perianal varices. MRI findings are valuable in

tailoring treatment strategies, especially when interventional procedures are considered [10].

### **Venography**

When ultrasound and MRI findings are inconclusive, venography considered the gold standard—can help diagnose complex PCS cases. This technique provides a clear picture of vein structure and function, which is critical for understanding the severity and impact of venous reflux in the pelvic region [11].

### **Current and Emerging Treatments for Hemorrhoids in PCS Patients**

The complexity of managing hemorrhoids in PCS patients calls for a dual approach targeting both the hemorrhoidal veins and the underlying venous insufficiency. Traditional methods are now complemented by emerging therapies, with promising outcomes.

### **Conservative Management**

Lifestyle and dietary changes remain foundational treatments for hemorrhoids, particularly in patients with venous insufficiency. High-fiber diets, hydration,

and exercise help reduce straining and intra-abdominal pressure, potentially alleviating hemorrhoidal symptoms in PCS patients [12].

### **Sclerotherapy**

Sclerotherapy, where a sclerosing agent is injected into the affected veins, has been effectively used for both PCS and hemorrhoids. It reduces vein size and symptoms by causing vein fibrosis and eventual absorption. While traditionally more common in hemorrhoid treatment, sclerotherapy has shown success in managing pelvic varices associated with PCS as well [13].

### **Radiofrequency Ablation (RFA)**

Radiofrequency ablation (RFA) is a minimally invasive option increasingly used in treating hemorrhoids and PCS. The technique involves applying thermal energy to close affected veins. Studies indicate RFA's high success rate in achieving durable symptom relief, with minimal recovery time compared to traditional hemorrhoidectomy [14].

1. Mechanism and Application: RFA works by delivering heat to varicose hemorrhoidal or pelvic veins, causing

them to contract and close. This reduces both hemorrhoidal symptoms and pelvic pain, providing an effective solution for patients with dual venous conditions [15].

2. Clinical Outcomes: Clinical trials show that RFA significantly improves symptoms in over 80% of patients, providing relief from pain and varicosities associated with hemorrhoids and PCS [16].

### **Laser Therapy**

Laser therapy has gained recognition as an effective hemorrhoid treatment due to its precision and minimal invasiveness. It applies concentrated energy to ablate hemorrhoidal veins, reducing recurrence rates and ensuring rapid recovery.

1. Mechanism and Technique: Laser therapy allows targeted ablation of hemorrhoidal tissue, preserving surrounding tissue and minimizing recovery times [17].

2. Effectiveness and Applications: Laser therapy's success rate is high, with many studies showing symptom improvement and a low recurrence rate, making it an attractive option for hemorrhoids, especially in PCS patients [18].

### **Future Directions in Hemorrhoid and PCS Treatment**

Emerging research in genetics, advanced imaging, and new interventional approaches continue to evolve the field of venous disease management. Potential directions include:

1. Genetic and Biomarker Research: Identifying genetic predispositions for PCS and hemorrhoids could enable personalized treatment approaches, allowing clinicians to better predict patients' risk and tailor preventive measures [19].

2. Innovations in Imaging: New imaging techniques like 3D MRI and venous mapping promise greater accuracy in diagnosis and treatment planning, especially for complex cases of PCS with hemorrhoidal involvement [20].

3. Combined Modalities: Integrating multiple modalities such as RFA, laser therapy, and lifestyle adjustments offers a promising approach for patients affected by both PCS and hemorrhoids. Further research is needed to optimize these combinations for long-term effectiveness.

## Conclusion

The shared pathophysiology between PCS and hemorrhoids underscores the importance of a comprehensive management approach that addresses both conditions. Advances in diagnostics and minimally invasive treatments, such as radiofrequency ablation and laser therapy, offer effective solutions with fewer complications and faster recovery times. Future research into genetic markers, combined treatment modalities, and advanced imaging holds promise for more individualized care, ultimately improving quality of life for those suffering from PCS and hemorrhoids.

## Conflict of Interests

The authors' declare that there are no conflicts of interests.

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## How AI Can Improve Surgery in Breast Surgery

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### Introduction

Artificial Intelligence (AI) is revolutionizing multiple aspects of medicine, including breast surgery. The integration of AI in healthcare is transforming traditional surgical practices by providing advanced computational models that enhance decision-making, precision, and efficiency. AI-powered systems are now assisting surgeons and healthcare professionals in various ways, from detecting abnormalities with superior accuracy to optimizing surgical workflows and enhancing patient recovery.

The field of breast surgery, in particular, has seen significant improvements with AI-driven innovations. AI is being utilized in preoperative planning, intraoperative assistance, and postoperative care, significantly reducing human errors, improving surgical precision, and enhancing patient outcomes. As AI continues to evolve, its applications in breast surgery are expected to expand,

leading to safer procedures, better cosmetic results, and improved overall patient experiences.

AI-based image recognition tools have revolutionized early breast cancer detection by enabling more precise and quicker diagnoses. These AI algorithms analyse vast amounts of imaging data, identifying patterns that may be missed by human radiologists, thereby increasing the chances of early intervention. Additionally, AI plays a critical role in assessing a patient's risk of developing breast cancer by evaluating genetic, clinical, and lifestyle factors, allowing for personalized preventive strategies.

During surgery, AI-powered robotic systems and real-time imaging technologies enhance a surgeon's ability to navigate complex anatomical structures with high precision. AI-driven augmented reality (AR) overlays and intraoperative imaging systems provide real-time insights, assisting surgeons in identifying

critical structures, ensuring complete tumor removal, and preserving healthy tissue. Furthermore, AI-based tools facilitate efficient decision-making, improving patient safety and minimizing complications.

Postoperatively, AI assists in monitoring wound healing, predicting complications, and personalizing rehabilitation programs. Advanced machine learning algorithms analyse patient data to detect early signs of infections, optimize pain management, and tailor follow-up care, reducing hospital readmissions and improving long-term outcomes.

This article explores the various ways AI is transforming breast surgery, delving into its role in preoperative planning, intraoperative precision, and postoperative recovery. By examining the latest advancements and potential future developments, we gain insights into how AI continues to reshape the landscape of modern breast surgery, offering hope for enhanced patient care and better surgical outcomes.

## **1. Preoperative Applications of AI in Breast Surgery**

### 1.1 AI in Breast Cancer Diagnosis

Breast cancer diagnosis relies heavily on imaging technologies such as mammography, ultrasound, and MRI. AI-driven algorithms, particularly deep learning models, have demonstrated remarkable accuracy in detecting breast cancer earlier than traditional methods. AI can analyse large volumes of imaging data, identifying minute abnormalities that may escape the human eye.

For instance, AI-enhanced mammography screening tools, such as Google's DeepMind and IBM's Watson, assist radiologists in distinguishing benign from malignant tumors with higher accuracy. Research suggests that AI models can reduce false positives and false negatives, leading to more precise diagnoses and minimizing unnecessary biopsies.

### 1.2 AI-Driven Risk Assessment for Breast Cancer

AI is also transforming breast cancer risk assessment by analysing genetic, clinical, and imaging data. Algorithms like those used in the Tyrer-Cuzick model and Gail model integrate patient history and imaging findings to determine the likelihood of breast cancer development.

This personalized risk prediction enables early intervention, lifestyle modifications, and increased screening frequency for high-risk patients.

### 1.3 AI in Preoperative Planning

Before surgery, AI helps surgeons create precise surgical plans by analysing patient-specific anatomical and pathological features. AI-driven 3D modeling software reconstructs the breast structure, allowing surgeons to visualize the tumor location and margins accurately. This aids in determining the best surgical approach, whether it is breast-conserving surgery (BCS) or mastectomy.

Additionally, AI optimizes breast reconstruction planning. It predicts postoperative breast symmetry, helping patients and surgeons decide on the most suitable reconstructive technique. Virtual simulations based on AI-generated models provide a preview of expected surgical outcomes, improving patient satisfaction and confidence in the procedure.

## **2. Intraoperative Applications of AI in Breast Surgery**

### 2.1 AI-Enhanced Image-Guided Surgery

During breast surgery, AI assists in real-time decision-making through image-guided systems. AI-powered tools such as fluorescence imaging and augmented reality (AR) overlays help surgeons visualize tumor boundaries, reducing the risk of incomplete tumor excision.

One of the groundbreaking technologies in this field is the use of AI-driven hyperspectral imaging (HSI), which distinguishes cancerous tissue from healthy tissue during surgery. By providing real-time feedback, HSI minimizes the chances of residual tumor cells and the need for re-excision.

### 2.2 AI in Robotic-Assisted Breast Surgery

AI-driven robotic surgery systems like the Da Vinci Surgical System enhance surgical precision, dexterity, and control. These systems use AI algorithms to analyze surgical movements, providing real-time feedback to improve technique and reduce errors. Robotic-assisted breast surgery offers greater accuracy in tumor removal, nipple-sparing mastectomies, and complex reconstructive procedures.

### 2.3 AI-Powered Intraoperative Margin Assessment

Incomplete tumor removal is a significant concern in breast-conserving surgery. AI-driven intraoperative margin assessment tools, such as the iKnife (intelligent knife), use rapid evaporative ionization mass spectrometry (REIMS) to differentiate between cancerous and healthy tissues in real-time. This reduces the risk of leaving residual cancer cells and lowers reoperation rates.

Another AI tool, the MarginProbe system, uses radiofrequency spectroscopy to detect tumor margins, ensuring complete excision during the initial surgery. Such innovations contribute to better oncological and cosmetic outcomes.

## **3. Postoperative Applications of AI in Breast Surgery**

### 3.1 AI in Wound Healing and Postoperative Monitoring

AI-driven wound assessment tools track the healing process, identifying complications such as infections or delayed healing at an early stage. Machine learning algorithms analyze wound images and detect subtle changes that may

indicate potential issues, enabling timely intervention.

AI-powered wearable sensors and smart bandages monitor physiological parameters like temperature, oxygenation, and pressure, ensuring optimal wound care. These technologies reduce hospital visits, allowing remote patient monitoring and improved recovery experiences.

### 3.2 AI in Predicting Surgical Outcomes and Complications

AI models assess postoperative complications such as lymphedema, seroma formation, and surgical site infections. By analyzing patient data, AI can predict which individuals are at higher risk for complications, prompting preventive measures and personalized postoperative care plans.

Furthermore, AI algorithms evaluate aesthetic outcomes after breast reconstruction. Deep learning models analyze symmetry, contour, and volume, providing objective assessments of surgical results and guiding revision surgeries if needed.

### 3.3 AI in Breast Cancer Recurrence Prediction

AI assists in predicting breast cancer recurrence by analyzing histopathological

slides, genomic data, and patient records. Advanced AI models identify patterns associated with recurrence risk, helping oncologists tailor follow-up strategies and adjuvant therapies.

#### 4. Ethical Considerations and Challenges

Despite AI's promising applications in breast surgery, ethical and technical challenges remain. These include:

- Data Privacy and Security: AI relies on extensive patient data, raising concerns about confidentiality and data breaches.
- Algorithm Bias: AI models may exhibit biases based on training data, affecting accuracy across different populations.
- Surgeon Acceptance and Training: Integrating AI into surgical practice requires proper training and acceptance by medical professionals.
- Regulatory Approvals: AI-driven surgical tools must undergo rigorous validation and approval processes before clinical implementation.

Addressing these challenges is crucial for the widespread adoption and success of AI in breast surgery.

#### 5. Future Directions and Innovations

The future of AI in breast surgery is promising, with ongoing research focusing on:

AI-Driven Personalized Surgery: Tailoring surgical techniques based on individual patient data.

- *Real-Time AI-Integrated Augmented Reality (AR)*: Enhancing intraoperative visualization for better precision.
- *AI-Guided Nanotechnology*: Using AI to develop targeted drug delivery systems for breast cancer treatment.
- *Deep Learning for Histopathology*: Improving cancer classification and grading through AI-driven pathology analysis.

#### Conclusion

AI is revolutionizing breast surgery, offering significant advancements in preoperative planning, intraoperative precision, and postoperative care. By improving diagnostic accuracy, surgical outcomes, and patient recovery, AI enhances the overall effectiveness of breast surgery. However, addressing ethical concerns and integrating AI seamlessly into clinical practice remains essential for its widespread adoption. As

AI technology continues to evolve, its role in breast surgery will expand, leading to safer procedures, improved patient outcomes, and more personalized treatment approaches.

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This year the Annual General Meeting (AGM) will be so important as in the UK and in the rest of the world we have a new association with nearly 5 years of activity to guarantee a combination of approaches, ideas and techniques that will help doctor, medical student, physician associates, advanced nurse practitioners, nurse, biologist on learning and growth by events, courses, appraisals, publications in our Journal.

The virtual meeting work we are now used to has been extremely helpful to stay in contact and to maintain our worldwide workstream. However, it is not a perfect substitute for meeting in person. We look forward to 2026 as a year in which we will try to recover some of our close international cooperation. Our Council is planned for a hybrid meeting. We hope to see as many of my council members and delegates as possible and to greet them in person.

We have supported all our members to looking for career progression, career guidance, looking to migrate to UK or any other overseas.

Health matters and award to encourage individual research in medicine. Our strategic mission remains to “look after health workforce so they can look after you” as this is designed to ensure we place our members at the heart of what we do, so that they can concentrate on ensuring patients receive the best possible care, as we stand as one profession of doctors and all health professionals.

VejoVis, the international medical association of United Kingdom in the AGM need to discuss about to foster more international cooperation and investments to achieve more equitable health, Universal Health Coverage, and a more robust global public health structure.

Our organisation each year provided support services for many of members undergoing appraisals and revalidation. We helped independent sector doctors from a wide range of backgrounds specialties and scopes of practice by provided appraisals and assisted them with finding routes to revalidation.

The AGM is an annual general meeting of all members must be held in January each year and called by the Secretary on 14 days' written notice to the members stating the date, time and place of the meeting, and the business to be conducted.

The business will include:

- (a). presentation and summary explanation by the Treasurer of (a) the Association's annual accounts for the financial year last ended and (b) a budget for the Association's current financial year for approval of the members (if they so decide);
- (b). consideration of the Executive Committee's annual report;
- (c). election of Officers, members of the Council Committee from all the members with the right to vote.
- (d). election of Officers, members Executive Committee and Auditors from

all the Foundation members with the right to vote.

(e). election of Officers, Chairman (President) from all the Foundation members with the right to vote. Who is appointed in recognition of the merits in the Medical Science.

(f). such resolutions as are stated in the notice of the meeting.

**Special General Meeting:** At any time the Executive Committee or any 2 members may by a joint written notice request the Secretary to call a meeting of members and the Secretary must then a call a Special General Meeting on no less than 21 days' written notice to all members stating the date, time and place of the meeting, and the business to be conducted.

The quorum for for the Annual General Meeting and any Special General Meeting is at least 50% of voting members, whichever is larger.

The voting members present elect a chair for any general meeting whenever the Association Chair is not present from a member of the Council Committee.

Minutes of the General Meetings must be taken and made available to all members.

### **Notices**

Any notice required or allowed to be given to any member under these Rules is validly

given if: (i) sent by post to that member's address in the Member's Register (in which case it is deemed given to the member 2 days after posting); or (ii) given to him personally; or (iii) sent by email or fax to that member's email address or fax number in the Members' Register.

Any notice required or allowed to be given by any member to the Secretary under these Rules is validly given if sent by post, email or fax to the Secretary at the postal address, email or fax number most recently notified to members by the Secretary. It is deemed given when actually received at that address, email or fax number.

### **Resolutions and voting**

Resolutions and other decisions at all General Meetings, Executive Committee or any sub-committee meetings are passed and made if so voted by a majority of those members present and voting when the vote is taken.

Voting may at the discretion of the Chair be undertaken by show of hands, by ballot or by show of hands followed by ballot.

Proxies are not allowed.

### **Membership**

Being a VejoVis member is the only way to guarantee a combination of approaches, ideas and techniques that will help you manage your own learning and growth. Support all our members to looking for career progression, career guidance, looking to migrate to UK or any other overseas country as a doctor, medical student, physician associates, advanced nurse practitioners, nurse, biologist.

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promotion or carrying out of the foregoing objects or any of them.

The President

*Vittorio Lombardo*, MD, FACS

**The object(s) of the Association are as follows:**



1) to promote the medical and allied sciences, to maintain the honour and interests of the medical profession and to promote the achievement of high quality health care;

2) to hold or arrange for the holding of periodical meetings of the members of the Association and of the medical profession generally;

3) to circulate such information as may be thought desirable by means of a periodical journal, which shall be the journal of the Association, and by the occasional publication of transactions or other papers;

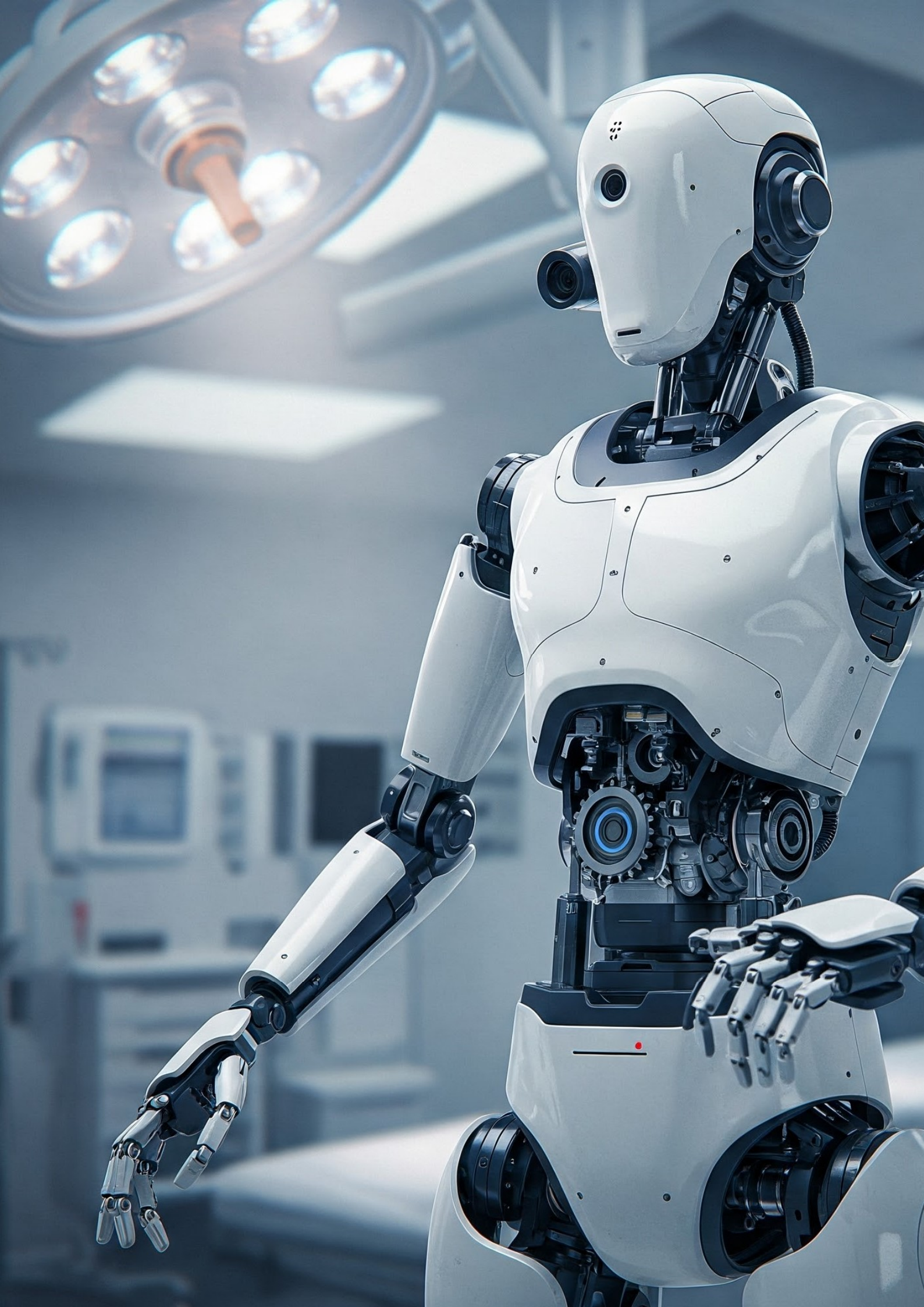
4) to facilitate access to resources and help promoting the medical and allied sciences in such manner as may from time to time be determined;

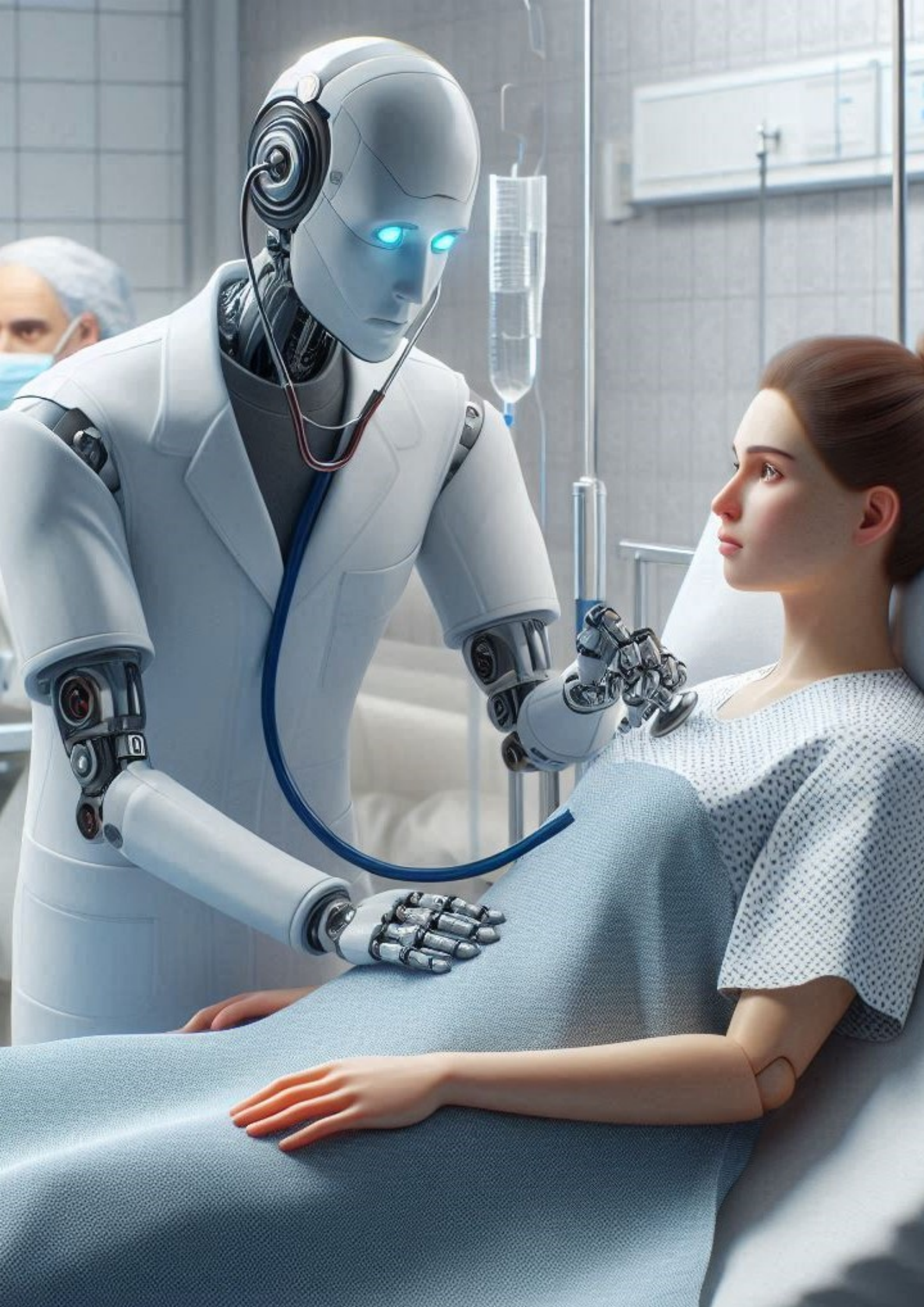
5) to do all such other lawful things as may be incidental or conducive to the



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