

# Adoption of minimally invasive mitral valve surgery in the NHS. A blend of science and psychology.

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July 20, 2021

## Abstract

**OBJECTIVES** The objectives of this study were to understand the challenges faced by early adopters of MIS mitral surgery in the national health system in the United Kingdom. It was to (i) capture the significance of the scrutiny introduced by reporting surgeon specific results during the introduction of surgical innovation, (ii) understand how individual personality and behaviour helped these surgeons succeed despite, in many cases, little wider support, (iii) to help more surgeons adopt these patient-centred techniques. **SETTING AND PARTICIPANTS** The study is based on a qualitative exploration of the reported experiences of all ten early adopters of MIS cardiac surgery in the NHS between 2006-2016. Interviewees were recruited by invitation through their professional society (BISMICS). All interviewees consented to the process; ethical permission was not deemed necessary. **RESULTS** The experience of introducing surgical innovation into the NHS was unanimously noted to be difficult with few incentives and many systemic and institutional obstacles. Despite this there was a general belief in pushing forward with these patient centred procedures while accumulating the evidence to support it. **CONCLUSIONS** Individual determination, confidence, mental agility and self-reflection were seen as characteristics of those who were successful. All surgeons agreed that the reporting of surgeon specific results were not conducive to adoption of innovation in teams. Starting a new program as two surgeons appeared to help reduce perceived pressures. Surgical innovation and its early adoption are always likely to be difficult and needs to be recognised as such, within the NHS

## Title page:

Adoption of minimally invasive mitral valve surgery in the NHS. A blend of science and psychology.

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## RESULTS

The experience of introducing surgical innovation into the NHS was unanimously noted to be difficult with few incentives and many systemic and institutional obstacles. Despite this there was a general belief in pushing forward with these patient centred procedures while accumulating the evidence to support it.

## CONCLUSIONS

Individual determination, confidence, mental agility and self-reflection were seen as characteristics of those who were successful. All surgeons agreed that the reporting of surgeon specific results were not conducive to adoption of innovation in teams. Starting a new program as two surgeons appeared to help reduce perceived pressures. Understanding more about collegial motivation, how to influence others and navigate organisational politics is going to be crucial for younger surgeons when implementing surgical innovation. Surgical innovation and its early adoption are always likely to be difficult and needs to be recognised as such, and actively supported by addressing some of these concerns in the NHS.

## Background

Minimally invasive mitral valve surgery (MIS) was introduced to the United Kingdom National Health System (NHS) 24 years ago following interest created by American surgeons in the mid-1990s. They first experimented with dogs using long instruments to reach the heart through the ribs, rather than the breastbone, before introducing it to humans<sup>(1)</sup>. Since then, techniques have developed rapidly. Benefits of MIS for patients include less pain, faster recovery, and smaller scars. The advantages for the hospital include shorter length of stay<sup>(2)</sup>, and benefits to patients increase the appeal of the service, and in time, the realisation of greater income which may be an incentive in both privatised and nationalised systems. In the UK, many units implemented MIS techniques, but by early 2000 all had reverted to traditional sternotomy surgery, despite MIS gaining traction in Europe<sup>(3)</sup> and the US<sup>(4)</sup>.

A small number of UK cardiac surgeons, keen to adopt these techniques safely, honed their nascent interest in these procedures through independent training and mentoring in Europe. They returned to their units to reintroduce MIS in what was experienced as an unwelcoming, at times, hostile climate. Today there are over 10 units undertaking cardiac MIS, but MIS remains a minority interest and its successes are uncelebrated. Informal figures indicate that MIS mitral valve surgery constitutes approximately 8% of mitral valve cardiac surgery in the UK while in Germany, with a population only slightly larger than the UK, it represents 55%<sup>(5)</sup>.

Surgical innovation typically struggles to report evidence along traditional lines, such as randomised control trials (RCT), and the Surgeons struggled in the early stages of the surgical development process, according to the IDEAL framework<sup>(6)</sup> to produce such evidence. Support from professional bodies and the wider surgical community, together with a degree of institutional inertia, continues to present a barrier to attracting junior surgeons to the sub-specialty, and to making MIS more widely available to patients despite individual surgeon experiences being positive, and patients reporting high satisfaction. Adoption of MIS is well documented in other surgical specialties. Why then has it been a struggle for MIS to gain traction and become as popular a procedure in the UK as it has in Europe or the United States?

What makes these early adopters experience unique is that this learning was achieved in cardiac surgery with its low margins for error on a background of intense scrutiny. A small number reported conditional support from a few colleagues and their organisations; the majority reported active resistance in the form of public criticism of their ethics and motives; suspicion about outcomes in the absence of RCTs; lack of funding for necessary equipment; resistance to requests to train and form stable operating teams and, lack of curriculum support for training junior surgeons. Although the Surgeons did not perceive the lack of

support and criticism as personal, these were significant hurdles. Scepticism also played a role, as it does with most innovation. Within this context, introducing MIS mitral surgery has proven a bumpy ride, with some distance yet to go, proving that introducing new, innovative technology into complex organisations is more difficult than anticipated <sup>(7)</sup>.

The aims of this study are to (i) capture the significance of the scrutiny through surgeon specific results for the safe introduction of surgical innovation, (ii) understand how individual personality and behaviour helped these Surgeons succeed despite little evident support from colleagues and national bodies, (iii) attract more surgeons to adopt these patient-centred techniques.

## Method

Prompted by one of these Surgeons, a group of nine “early adopter”<sup>(7)</sup> Surgeons, members of the British and Irish Society for Minimally Invasive Cardiac Surgery (BISMICS), who started a MIS mitral valve surgery programme between 2006 and 2016 were interviewed individually or in groups of two and three to share their early experiences. Interviews were virtual and of 60 to 90 minutes duration. Their services currently cover the length of England and between them they provide potential access to MIS cardiac surgery to nearly 20 million people.

The retelling of their experiences was prompted through open questions and listening to each other’s narrative which triggered thoughts about similarities and differences in individual experiences. An analysis was conducted by the first and last authors, broadly based on the principles of thematic analysis <sup>(8)</sup> and was validated by the larger group.

## Results

The results are reported as themes under the following five headings.

### The Importance of Context

#### *Systemic Risk Aversion*

Several interviewees intimated that the NHS was always going to be cautious in accepting MIS and that, in practice, surgical innovation is not easy even with collegial and managerial support especially given UK cardiac surgery’s unfortunate history resulting in heightened caution and even mistrust of surgical motivation and innovation. The Bristol Inquiry (2001) reporting on the tragic outcomes in paediatric cardiac surgery (1991-1995) in Bristol, together with other tragedies involving individual surgeons with poor patient outcomes, attracted media interest and threatened surgical endeavour that was not fully evidence based.

Technically, MIS is a challenging procedure and does not lend itself to the traditional “See one, Do one, Teach one” school of medical training. The development of complex surgical motor skills, perceptual-motor co-ordination and effective motor schemas required in MIS take time <sup>(8)</sup> and the misplaced confidence of a few Surgeons, after “seeing one” in the early years of MIS in the UK did not serve the MIS cause and added to the challenges these Surgeons had to overcome to reach their goals.

#### *Personal Risk*

National scrutiny of cardiac surgeons was introduced in 2005 with reporting systems showing named surgeon outcomes. While this was intended to provide public reassurance, it received a mixed reception with national bodies championing the initiative <sup>(9)</sup> and others more fearful. It had the unintended consequence<sup>(10)</sup> of dampening surgical motivation to innovate or to take on higher risk patients even though the data was risk adjusted. The Society for Cardiothoracic Surgery (SCTS) is currently reevaluating the efficacy of reporting surgeon specific results with a view to reporting on unit outcomes.

Making sense of these contextual issues seems to have led to a narrowing in the field of attention and the development of a shared mindset that innovation, with its associated risk in cardiac surgery, was not worth the risk. The priority became to reduce risk and perform<sup>(11)</sup> i.e. deliver outcomes in the traditionally accepted mode of open surgery rather than innovate. The personal risk associated with pursuing one’s

interest in this context was high with strong potential for being either a hero or a villain, the easier option being to take “*the middle road where you can be assured of a decent life and you won’t appear on the front pages of the tabloids*” .

### *Lack of Financial Support*

Funding for innovative cardiac surgery faces challenges not least because of competition from industry supported trans catheter procedures. The suggestion that Cardiac Surgery was being cannibalized (i.e. competed against) and might soon be redundant also made persuading others of its value difficult. Notwithstanding these competitive challenges, evolving research suggests that stents do not confer as long a result as originally expected, compared to coronary surgery<sup>(13)</sup> and given the increasing demand from patients and the vast need for treatment in the undeveloped world, MIS cardiac surgery does have a bright future if innovation is adopted widely<sup>(14)</sup>.

### **The Organisational Context**

Whereas MIS is seen by those offering it, especially in the US and Europe, as an opportunity to offer advanced patient care, attract patients to your hospital and boost organisational reputation and income, in the NHS, interviewees suggested that MIS is perceived as a problem.

The political cycle with changing ministers and NHS strategies, coupled with the rapid turnaround of hospital Chief Executives and shifting commissioner demands conspire to provide an unstable climate for innovation. The managerial approach, focusing on targets and productivity also proved a barrier. MIS typically takes longer than open access surgery thereby occupying valuable theatre space. It is not readily standardized making it difficult to train others quickly or for less expensive staff to perform it. No tariff changes were made and although some instrumentation was reusable, and manufacturers were helpful, considerable cost was added to each case. MIS also required anaesthetists and theatre staff competent and confident to support MIS surgical needs and this had staffing implications. From a financial and productivity perspective the organisations were not incentivised to support MIS.

Some interviewees suggested that certain hospitals believed themselves to be so successful that there was no need to foster innovation; others “*don’t think big*” or strategically in terms of extending their services. The challenge of attracting managerial support was exacerbated because it is far easier to champion a widely supported programme than one in which only a couple of people show interest. Thus, the organizational mindset proved problematic for some.

Surgeons referred to the importance of “buy-in” from their colleagues and collaboration with management. Only one interviewee joined a custom-built unit; three were specifically appointed to lead MIS programmes in larger hospitals thus being in the good starting position of having organisational legitimacy. Where the surgeon was a lone voice, challenges were extremely difficult.

Individuals had to chart their own course, make a business case requiring collegial endorsement, and deft negotiation for which Surgeons do not typically have training, skills or patience. Significantly, few had “*political clout*” at that early stage in their careers to persuade the senior establishment (managerial and surgical) off their cause. Only two Surgeons had a supportive senior colleague, providing an extra voice and champion in political and managerial discussions and acting as a “*shield*” leaving the mechanics to the surgeon most interested in MIS.

One surgeon made the point that managers do not see patients in clinic and so cannot readily appreciate the benefits of the surgery seeing it as a costly exercise associated with high risk and disruption. To influence senior management and garner support, another said that he deliberately invited the most senior managers to work with him on the business case, so sharing the organisational consequences. Another was buoyed by the feeling that he had had the support of the CEO. A fourth said that he initially resisted productivity pressure to perform more than one case a day so that he and the team could reflect and learn from each case. A fifth reported having to resist pressure from an anaesthetist to work more quickly to finish in time. Through the deliberate choice of senior management, and through managing the pace, these examples underline the

importance of finding an organizational advocate and gaining the confidence of other professionals by focusing on governance and reflection and not giving in to peer pressure.

## Collegial Support

Collegial support was forthcoming when these surgeons, as young trainees, contacted more established surgeons in the MIS field who were uniformly supportive. The use of contacts through the “old boys’ network” worked for others. Nonetheless, these supporters were not part of their employing organisation.

Where surgeons were specifically employed to an organisation sponsoring an MIS programme collegial support was forthcoming, for others when it was offered, it was greatly valued. Most interviewees recognised that they were somewhat alone in their efforts to introduce the initiative to their hospital, recognising “*it was never going to be easy*”.

The challenge, for some, from working surgical colleagues took the form of implied and explicit lack of support and even threat. This was summed up by one interviewee’s comment that, “*implied threat is voiced when you are asked if you can do the surgery, and then explicit threat can be assumed when you prove you can because you are then viewed as competition*”. Other illustrative examples offered included experienced surgeons who had tried MIS unsuccessfully and then “*rubbished*” it as a procedure; a surgeon being told by a more senior colleague as he was scrubbing for his first case “*if something goes wrong, I won’t support you*”. Only one interviewee offered that a senior colleague had said to him “*let me know how you are getting on and if you need help*”.

More insidious undermining was evident in the example of a consultant colleague writing to a senior medical colleague suggesting they scrutinise the MIS surgeon’s work. Challenges also came from supporting consultants (e.g. intensivists) about the length of time operations were taking. The interviewees commented that these consultants do not see the patient before **and** after the procedure when the patient is well again, and perhaps like all those unfamiliar with the positive outcomes, view the process with cynicism.

The experience of surgeons who started as a pair appeared to be better than those who started on their own and this may be a model for the safe implementation of new programmes where a buddy system is used in the initial learning phase to share both the stress and learning involved in success and/or failure.

Comments, reported by this group, make it clear that some surgical colleagues felt threatened by this new technique and those who practise it. While not uncommon in those who feel less willing to engage with innovation it would be naive to overlook more subtle psychological pressures such as professional jealousy and interpersonal rivalry. There are also likely to have affected the willingness of some to offer collegial support for the few willing to risk their careers for the sake of innovation and patient centred care despite the inevitable challenges that their motivation might be more about personal glory and improved income.

The MIS Surgeons seemed willing to face the risk of collegial opprobrium, perhaps being labelled a ‘black sheep’ for deviating from the norm and being side lined by the in-group <sup>(15)</sup> i.e. other cardiac surgeons, the group they are most likely to identify with and risk being ‘isolated’ from, that is, the establishment. From an ethnicity perspective, only one of the Surgeons from this early cohort, is White British, four others were born in the UK to Asian parents, and the remaining four were immigrants. Thus, they could be viewed as a group that was not typically part of the establishment.

## The Theatre Team

The Surgeons grappled with whether the procedures should be branded as “special” needing a specially trained team or whether MIS should be simply another procedure and cited this as one of the biggest challenges few managed to achieve in the long term. Most achieved a stable team, at the very least for initial training, but they were required eventually to work in what was described by one as a “Toyota type model” of working <sup>(16)</sup>. Customised units had fully trained regular teams; in others Surgeons had to adapt to working with a wide range of theatre staff and work with teams where there was no previous collective

learning<sup>(17)</sup>. Theatre management was unconvinced of the need for stable teams when they were promoting the idea of interchangeable and multi-skilled theatre staff in the interests of productivity.

Given the need to focus on a very narrow field of surgical vision in these MIS cases, situational awareness is the responsibility of the team. Trust, achieved through shared experience of working together, is essential to the development of interdependence. All Surgeons emphasised the importance of actively promoting psychological safety i.e. a shared belief held by members of a team that the team is safe for interpersonal risk taking<sup>(18)</sup> so that any team member would feel confident to ask a question or voice a concern.

The cost of even the smallest mistake, while extremely high, might be mitigated by reverting to open surgery but the associated criticism would not serve the MIS cause. Whereas similarly serious mistakes might occur in open surgery, a mistake in MIS attracted disproportionate criticism and led to comments which confirmed the naysayers' view that mistakes were due to the minimal access and that MIS was dangerous. The effect of confirmation bias<sup>(19)</sup> proved a strong barrier. Having a second surgeon as another pair of eyes was paramount, and reassuring for the team, but, uncommon 15 years ago. UK surgical training offers no formal MIS rotation for trainees to be exposed to MIS so junior surgeons were unavailable. Having the theatre team trained and similarly attuned to the procedure and its risks acted as a safety net.

All interviewees started with a team (Anaesthetist, Perfusionist and Scrub Nurse) who accompanied them to be trained by an experienced team. They spoke of instilling pride in the team and making each professional feel ownership of their part in the surgery. Their approach reflected the four-step process of enrolment, preparation, trials and reflection<sup>(14)</sup> for implementing innovation but, as is evident was not smooth.

Choosing the right team proved a challenge with one surgeon saying that the senior staff wanted to be involved but that he chose those he trusted most and who *"wouldn't surprise me"* underlining the importance of trust and suggesting competence trumps experience. Another explained that his choice of team led to accusations and allegations of racism, sexism, perfectionism and elitism. He said that jealousy increased as the team became successful and his experience at the time was mixed: *"if we had failed it would be bad, but success was also bad"*.

## The Surgeon

Remaining focused on the end goal was important given the risks. The reporting of individual surgeon outcomes on a macro-level is challenging but so is the scrutiny on the micro level in the hospital and in the theatre from immediate colleagues. The Surgeons were relatively young and junior, and it was suggested that it would have been more difficult if they had undertaken the MIS cause at a later stage in their careers.

Their determination in the face of the contextual challenges and lack of obvious support raises the question whether they possess attributes which differentiate them from others. The following five sets of personal characteristics were evident in the way the interviewees described themselves.

### *Resilience, Tolerance for Ambiguity*

All Surgeons reported awareness of the possible risk to their professional, and consequently personal lives, of pursuing and mastering MIS. Two comments typified the sentiment: *"I gave my whole soul to MIS"* and *"It's taken a lot of blood, sweat and tears"*. It was noted that four of the nine Surgeons interviewed were immigrants to the UK and had already experienced major disruption to their lives before embarking on the MIS journey, suggesting a degree of resilience that might be greater than average. They all talked about coping with pressure and stress, not only related to the operation, but that contributed by the context. They agreed they were *"comfortable being uncomfortable"*.

### *Horizon Scanning*

They felt early in their surgical career that they could not envisage doing the same thing for the rest of their career. This desire for challenge, and curiosity combined with what might 'horizon-scanning' i.e. checking and anticipating where surgical innovation might take the profession, combined to drive them.

### *Patient-Centered*

Their absolute belief that MIS was better for patients than open heart surgery intensified their determination. There was no definitive science to support the adoption of these procedures and it fell on them to both innovate and create the science to support their patient-centred beliefs.

### *Planning and Preparation*

The interviewees talked about the need for planning, preparation, and focused concentration before and during the operation. One said his planning and preparation took three years before he performed his first procedure.

### *Confidence and Self-Awareness*

Another commonality was strong self-belief and confidence. All interviewees were aware they might be perceived as arrogant rather than simply confident. Underneath this confidence was persistent self-questioning. They spoke about the need for constant reflection and continuous learning exemplified by the following comment: “When I look back on my proficiency 3 years ago, I can’t believe I thought that was good”.

### *Mental Agility and Reflection*

Manual dexterity, spatial ability and perceptual motor skills notwithstanding, the need to make quick decisions and develop a Plan B was emphasized as a characteristic of all surgeons but without the help of a colleague, the cognitive flexibility in navigating the complexity of MIS was different to what is typically required. Even experienced MIS surgeons do some open surgery and some felt that MIS improved their open surgery.

How these Surgeons framed their role and shaped their behaviour<sup>(18)</sup> is likely to have had a significant impact on their willingness to take the risk and innovate despite the heightened sensitivity and potential condemnation. Dweck’s notion of performance versus learning orientation is likely relevant and to have driven self-questioning and reflection. She differentiates the former as focused on the goal and outcome and the latter more focused on learning<sup>(20)</sup>. The message from all Surgeons was the clear – they needed a successful outcome and an openness to reflective learning.

**Limitations** This study has several limitations. The number of interviewees was small but captured all surgeons involved during the time frame. Their views are retrospective and subject to selective memory and bias. It would be useful to interview individuals who chose not to engage with MIS and compare their motivation and views, but this was beyond the scope. Further quantitative research is planned to explore the Surgeons’ motivation, mental agility, and personality traits to understand if these are different to those of other medical professionals. A randomised control trial comparing the new technique to the standard is currently being undertaken and is expected to report in February 2022 to support the evidence gathered so far that is considered anecdotal and based on Surgeon’s selective outcome reporting.

### **Conclusions**

The interviewees’ experience ranged from 2006 to 2016 demonstrating that this specific innovation did not become easier with time. On reflection these early adopters suggested that the technical challenges were the least of their problems because they were careful to be trained, proctored, and mentored and, in fact, were not the original pioneers but were following those who had broken the ground for them. What was more difficult to manage and understand was the lack of collegial, organisational and systemic support. In retrospect, exploring their own psychology, attempting to understand that of their colleagues, and the psychology of the system, might have made their journey easier. Research<sup>(21,22)</sup> suggests that the successful surgeon innovator must be savvy in medicine, technology, and business but this study shows that an understanding of psychology is central too. There was unanimous agreement that the publication of surgeon specific results did not help the cause of adopting new techniques within teams.



The hope is that lessons learned from this exercise will help the wider adoption of other surgical procedures like endoscopic conduit harvesting and minimally invasive coronary artery surgery and may have relevance for other surgical specialties too.

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