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Review

Crisis management for surgical teams and their leaders, lessons from the COVID-19 pandemic; A structured approach to developing resilience or natural organisational responses

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ABSTRACT

Background: Multiple industries and organisations are afflicted by and respond to institutional crises daily. As surgeons, we respond to crisis frequently and individually such as with critically unwell patients or in mass casualty scenarios; but rarely, do we encounter institutional or multi-institutional crisis with multiple actors as we have seen with the COVID-19 pandemic. Businesses, private industry and the financial sector have been in a more precarious position regarding crisis and consequently have developed rapid response strategies employing foresight to reduce risk to assets and financial liquidity. Moreover, large nationalised governmental organisations such as the military have strategies in place owing to a rapidly evolving geopolitical climate with the expectation of immediate new challenges either in the negotiating room or indeed the field of conflict. Despite both nationalised and privatised healthcare systems existing, both appeared ill-prepared for the COVID-19 global crisis.

Methods: A narrative review of the literature was undertaken exploring the approach to crisis management and models used in organisations exposed to institutional crises outside the field of medicine.

Results: There are many parallels between the organisational management of private business institutions, large military organisations and surgical organisational management in healthcare. Models from management consultancies and the armed forces were explored discussed and adapted for the surgical leader providing a framework through which the surgical leader can bring about a successful response to an institutional crisis and ensure future resilience.

Conclusion: We believe that healthcare, and surgeons (as leaders) in particular, can learn from these other organisations and industries to engage appropriate generic operational plans and contingencies in preparation for whatever further crises may arise in the future, both near and distant. As such, following a review of the literature, we have explored a number of models we believe are adaptable for the surgical community to ensure we remain a dynamically responsive and ever prepared profession.

1. Introduction

The sudden emergence of a crisis, such as COVID-19 has far reaching impacts within healthcare beyond the infectious disease aspects alone. The impact alone within surgery has been devastating both for surgeons and their patients. Certain surgical specialties such as head and neck surgeons, suffered early high exposure with a disproportionate incidence of illness [1] and surgeons overall accounted for 5 of the 18 doctors’ deaths of all doctors reported by the April 22, 2020 in the UK (more than any other specialty) [2]. Elective operating lists were cancelled for both

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benign and malignant disease, screening and out-patient assessment all but stopped and emergency care had constraints placed upon it. As we pass through the second wave of COVID 19 infections it is important that we learn from the first wave and adapt our healthcare systems by adopting crisis management strategies.

One key factor in any organisation response is the team. The surgical team is a hetero-genous entity comprising multiple disciplines, including surgeons, anaesthetists, inten-sivists, lead nurses, managers and allied health professionals, all working together to achieve a shared goal. Within each discipline there exists particular individuals who have the suitable qualities for leading a team through crisis. It is important to recognise that surgeons, though pivotal within the team are not necessarily best placed to lead the team. Recognising this and subsequently identifying leaders based on the qualities de-scribed throughout this manuscript is the first and most important step towards success-ful crisis navigation. It is also vital to recognise that although organisations are often hier-archical leaders and leadership roles occur and are adopted at any level throughout the hierarchy, from the Chief Executive Officer or Chief of Surgery through to and including ancillary or support staff. The requirements of leaders and leadership at each level are crucially different but as part of a whole are no less important or vital. Leaders at each strata of an organisations will have different logistical, theoretical and practical roles which are required for a natural organisational response. Such leadership and a willingness to speak up, highlight problems effectively and vitally ensures experts at each level can propose solutions and institute change.

From a management standpoint we recognised that the level of preparedness and ap-proach to crisis management has been both dis-organised and at times dysfunctional. In 2014, at the Whitehouse briefing on the Ebola epidemic response, Barrack Obama stated “There may and likely will come a time in which we have both an airborne disease that is deadly. And in order for us to deal with that effectively, we have to put in place an infrastructure - not just here at home, but globally - that allows us to see it quickly, isolate it quickly, respond to it quickly” [3]. Despite such warnings, the world appeared relatively un-prepared for the crisis that was to unfold. France, for example, were inciner-at ing their stockpile of FFP3 and surgical masks until March 2020 despite the presence of Sars-CoV-2 in the country [4]. Our aim was to identify models which were simple, re-producible and adaptable guiding the surgical leader through the management of insti-tutional crisis leading to a resilient, natural organisational response.

2. Method

A narrative review was performed to identify management models from outside medicine applicable to healthcare structures. We applied these to key areas perceived to be in need of durable strategies that benefit our patients and healthcare organisations where uncertainty and change occur. We searched primarily for models that focussed upon sustainability and antifragility; concepts that must be the foundation of any successful strategy to manage healthcare crises. Models were dis-cussed by the authors who are experienced in surgical leadership and organisational management and subsequent models were adapted to suit a surgical response.

3. Results

From our review two approaches exemplified how a crisis can be managed successfully. The first approach is the Respond, Recover and Thrive model; based on how the busi-ness world is reacting and planning ahead by putting their customers and the prosperity of their organisa-tions first. The second approach considered utilising a military model; a rapid response approach shapes the characteristics of a well-prepared army to fight the “invader”.

4. Respond, recover and thrive (RRT) business model

The local, regional and global medical environment is challenging, complex, and unpre-dictable. The need for multi-level leadership has never been greater, and the demands on leaders are ever increasing. The “surgeon leader” needs to have an understanding of leadership at all levels of an organisation and the skills inherent to successful leadership. This crisis has afforded an opportunity for natural leaders and decision makers from within the surgical team, who could promote their skill set and develop expertise in this field. A “mega-crisis” such as the current pandemic demands effective surgical leader-ship today and requires different competencies to those of the past. One model that may be beneficial in this evolving crisis is that presented by the consulting firm Deloitte (Lon-don, UK) [5]. Deloitte, as experts in crisis response and management in business, and have published widely in this area. They state that a crisis, such as the COVID-19 pan-demic, develops over three-time frames or phases termed Respond, Recover and Thrive. Respond, in which an organisation deals with the present situation and manages conti-nuuity; Recover, during which it learns and emerges stronger; and Thrive, where it pre-pares for and shapes the “next normal”.

This model sets out the fundamental qualities of resilient leadership and defines the ba-sics by which one responds to a major threat and combats it with a well-orchestrated plan of action allowing a stronger recovery. This model is summarised in Fig. 1.

5. “The respond phase”

The following five characteristics of resilient leadership will distin-guish successful leaders as they guide their enterprises through and “respond” to the emergence of a new crisis.

These are qualities that today’s surgeons need to have and base their response on to the COVID-19 crisis upon.

5.1. Design from the head and the heart

In crisis, the hardest things can be the softest things. Resilient leaders are those who genuinely, sincerely, empathetically and compassionately walk in the shoes of col-leagues, patients, and those of their broader medical communities. Crisis managers must however, as resilient leaders, assume a hard, emotionally detached and rational line to protect both financial and clinical performance from the invariable emotionality that ac-companies such disruptions. Surgeons among healthcare leaders are experts in weigh-ing up risks against benefits and during crisis de-cisions should be made pragmatically based on the most up to date available information ensuring the balanced weighs in favour of the benefits.

Uncertainty can paralyse decision-making; responding by the central-isation of decision-making into fewer nodes allows consistency, speed, and most importantly decisiveness. We have seen examples of this centralisation with positive feedback such as “cancer hubs” and other centralised modes of treatment delivery. Surgeons and leaders of all levels must have a catalogue of their resources and each site/ department must have a clear and decisive plan on how to respond. Tools such as the remote readiness frame-work shown in Fig. 2 can help plan and allocate resources. Rapidly articulating data driven scenarios with modelling the projected clinical and financial impact must be readily available to help with the continuous and responsive counter planning. Each organisation needs to define “non-negotiables” and for us as medical professionals; patients and staff safety should take pri-macy. Finally, identifying the “levers” leadership has available and determining the precedence of actions to take, with firm agreement on the hierarchy of levers to be pulled as the severity of scenarios unfolds is also of paramount importance.
5.2. Put the mission first

Surgeons are trained throughout their career and clinical practice to be skilled in triage. This ability to prioritise means they can rapidly appraise the crisis at hand, seeking out opportunities amid difficult constraints and ultimately aim to stabilise their organisations. To achieve this, priorities should include launching and sustaining a crisis command centre, supporting talent and strategy while maintaining business continuity of care within the financial constraints. Other major focuses within the respond phase that a surgeon ought to have are the strengthening of digital capabilities while staying engaged with patients, shoring up the supply chain and engaging with the ecosystem of their organisation. A surgeon who is able to achieve these mission objectives under the constraints of crisis could be termed a “Resilient Surgeon”.

5.3. Speed over elegance

Resilient surgeons should take decisive action with courage and conviction based on imperfect information, knowing that expediency is essential. Within this they should expect scrutiny and criticism that will arise following dissection of the crisis management plan after resolution. Surgeons are familiar with this concept; a catastrophic and critical situation in the operating theatre requires similar expediency, often with limited information and an expectation of detailed analysis and positive and negative criticism following the event either by the patient’s family or as part of existing governance structures.

5.4. Own the narrative

Seizing and owning the narrative at the outset, being transparent about current realities, including what we do not know, whilst also painting a compelling picture of the future that inspires others to persevere, is another fundamental quality required by a surgeon as part of the respond phase. In a time of crisis, trust is paramount. This simple formula emphasises the key elements of trust for individuals and for organisations:

$$\text{Trust} = \text{Transparency} + \text{Relationship} + \text{Experience}$$

5.5. Embrace the long view

Surgical leaders and their teams should maintain focus upon the horizon, anticipating new organisational models that will emerge whilst sparking the innovations that will define tomorrow. Resistance to change at times can be appropriate but acceptance that change is inevitable and pragmatism must be a key component of the resilient surgeon’s make-up.
6. “The Recover Phase”

Resilient surgeons view recovery as a journey for their organisation, teams and stakeholders. There are five imperatives within the Recover Phase of the model to guide them from Respond to Thrive.

6.1. Mindset shift - understand the required

Here the crisis-situation shifts from the unpredictability and frenetic activity of the early Respond period to a more settled, though still uncomfortable, sense of uncertainty (an “interim” normal). The focus of leadership expands from a very inward (and entirely appropriate) focus on employee safety and operational continuity to also include embracing a return to what is termed in business a “market-facing posture”. Organisations and surgical departments should be seen as being ready to return to business, available services should be made apparent to those feeding the market, be that hospital colleagues or primary healthcare. Patient fear and uncertainty must also be managed appropriately with the expectation that due process in place and their safety considered central to the newly evolved service. Management goals shift from managing the crisis; keeping the organisation functioning; to managing the transition back to a restored future. Planning shifts from short-term contingency planning to mid and long-term economic and scenario planning to understand the related impacts on clinical outcomes, operational procedures, employees, finance, and so forth. Leadership attitude shifts from the primarily reactive mode described above to anticipating how to reinvent the organisation for this new era.

6.2. Identify and navigate the uncertainties and implications

The substantial shifts in society, its institutions, and its individuals during the crisis have introduced major uncertainties into our once familiar structures. These shifts have resulted in macro-level changes with uncertainties about the underpinnings of healthcare, business and society that resilient leaders in any profession must navigate. Changes in the social contract and societal expectations of healthcare bodies and institutions are reframed to ensure the viability of all stakeholders. In business the implicit contract between corporations and their stakeholders has always been based on accepted and generally unspoken assumptions about “the way things are” or status quo. But in a crisis the status quo has been forcibly changed, and that contract, as such, is rewritten requiring changes in the roles and rules for institutions. This parallels with the healthcare and surgical model, patient’s priorities are readdressed, their concept of acceptable risk changes and as such their relationship and expectation of their surgeon will change too. Managing the expectations of stakeholders associated with an institution from the Respond to the Thrive phase is paramount; Fig. 3 sets out a model through which this can be achieved.

The pandemic has precipitated financial discord through governments, economies, corporate sectors, financial institutions, treasurer’s offices, small businesses, non-profit organisations and individual purses. The sources and uses of cash and the movement of liquidity during the crisis have been unpredictable; with resources poured into some sectors and other sectors squeezed financially. An expectation should also be present of the leaner times to come during the recovery phase where financial flows must be balanced. Leaders must plan for wide variations in their financial position and needs, all of which are dependent on the disease’s progression, the level of government stimulus, and the pace of economic recovery. Expectations are raised for physical, emotional, financial, and digital safety. Recovery will create anxiety among stakeholders as the post-COVID world takes shape. Understanding the fears of stakeholders and how their expectations for safety and security have changed, perhaps permanently, will be critical for surgical leaders as they seek to restore confidence and plan for the future.

Fig. 2. Remote readiness framework model for planning activities and services [6].
6.3. Embed trust as the catalyst to recovery

During the Recovery phase, resilient surgeons must inspire their teams to navigate through the significant COVID-related uncertainties. But great leadership requires even greater “followership” and “followership” is nurtured by trust. Many leaders have built a significant bank of trust from deftly navigating through the early frenzied unpredictable stages of the crisis and this should be encouraged and perpetuated.

6.4. Define the destination and launch the “recover playbook”

Defining the destination first and then working backward is an approach that can help surgeons create more ambitious and creative plans. Envisioning the leadership team in a position of success is emotionally enabling, and it frees the team from some of the constraints of the present. It also disrupts incremental thinking, which often hampers creativity. Surgeons, as leaders of today, will need to ask key strategic questions when defining the destination e.g. what is most important in creating advantage: strategy, structure, or size? The answers can suggest a variety of tactics to pursue during recovery, such as accelerating implementation of pre-COVID-19 strategic options, scaling pilots in progress, developing novel organic models and approaches such as centralisation of services e.g. cancer hubs, public-private partnership and joint hospital networks [7]. With this comes the need of finding “deal opportunities” among struggling or failing units or hospitals.

6.5. Learn from the successes of others

Recovery is uncharted territory and therefore observing and learning from others recovery strategies is critical. Other nations and other healthcare systems will be leading the curve and close observation and collaboration with colleagues at other centres is vital. Mistakes as well as successes will have been made by them and a pragmatic and flexible collegiate approach will help the resilient surgeon avoid erroneous approaches and capitalise upon successful models.

7. “The thrive phase”

This crisis has unexpectedly redefined how surgeons interact with their patients. Every surgical unit needs to adapt, change and innovate their practices to remain viable and productive. There are no exceptions. Units and individual surgeons who fail to act will likely find it difficult to recover and thrive.

7.1. Understand the patients

Every surgeon needs to understand what goes on in their patients’ lives to have true empathy and compassion, although this has always been so. In-depth knowledge of what people have experienced in recent months forms the starting point for strong patient relationships and all else can follow. Doctors and patients have navigated the care delivered during this unprecedented medical crisis, as public health officials strongly urge them to avoid in-person visits to offices, clinics and hospitals. Telemedicine has been widely and discretely implemented. Video links are being used by doctors not only to treat COVID-19 patients who are not severe enough to require hospitalisation but also to assess anyone who needs routine care. Insurers and healthcare organisations have been challenged to embrace telemedicine along with doctors and patients. Obstacles that once may have prevented adoption have fallen away quickly. The surgical community are used to using technology and have readily embraced it, however, patients may not and we must not forget this and must ourselves be patient and willing to adapt to a better negotiated model for patients.

While convenience yields to necessity during a lockdown, telemedicine may be a solu-tion, adopted out of duress, that will create significant post-crisis advantages for those who get it right. Cost and time efficiencies are being demonstrated that doctors and patients will likely remember beyond the pandemic. Beyond convenience, telemedicine may become a lasting solution, even after the COVID-19 threat recedes, to those who have long feared contracting an illness in a doctor’s office. It may also bring with it cost savings both to healthcare organisations and patients which will become even more im-portant in the recovery phase as global markets settle and state coffers refill.

7.2. Bring empathy and humanity

The social distancing required to slow the spread of the coronavirus has refocused our attention toward more basic needs. Prestige and self-actualisation become less im-portant when people are locked down at home or worried about how to get to and from an essential job and stay safe at work. The priorities people have shifted toward family, food,
learning, work, and money. This highlights the need for every patient experience strategy to be grounded in empathy and human needs. It shows why today’s surgeons need to sharply focus all patient interactions on building trust.

7.3. Embrace digital acceleration

Most businesses and healthcare providers have taken to heart the necessity of digital transformation to stay current and competitive. But now it’s suddenly vital for every organisation to accelerate their effort and boost their urgency. If digital tools are suddenly the only way to reach your patients, the need is obvious and existential.

7.4. Be open to collaboration

With lockdowns and contagion concerns motivating new ways, some businesses are responding by collaborating with organisations that they would never have previously considered. This is a matter of business leaders looking beyond how things have always been done. The ecosystem of partnerships that makes business possible is extensive and varied. Rethinking how it’s put together can allow for greater creativity in response to a crisis and, in some cases, an opportunity for differentiation when the crisis ebbs. New public-private partnerships will form; services may be better delivered in a certain manner in an environment different to that which we are traditionally used to. Private hospitals, for example, may be better placed to manage rapid throughput day case work-loads through profit-based delivery systems whilst larger, potentially state led, institutions may be better equipped to manage larger cases and therefore state and private providers both benefit from closer mergers and partnerships. An extension of this concept is the utilisation of the “expert stranger” when unfamiliar concepts and problems are encoun-tered by the team or the leadership. An expert stranger, as an individual with expertise in addressing a particular novel concept, enters an organisation and provides advice and input to allow an appropriate organisational response. Recognition and early employment of such individuals helps develop and train an adaptable and reactive team and mentor nascent and established leaders within the organisation broadening their experience.

7.5. Build for agility and adaptability

Successful businesses have long recognised that being nimble, flexible and adaptable provides competitive advantages; the COVID-19 pandemic has reinforced that principle. Companies that pivoted quickly to fix deficiencies in their customer model exposed by new social distancing practices have been rewarded. Businesses that have adapted quickly have kept lines of communication open with customers and have benefitted from ongoing brand loyalty and this must be encouraged within the surgical community. When rebuilding our healthcare models, adaptability should be key, streamlining procurement and removing roadblocks associated with stale and fragmented state segments are vital.

7.6. The military model

Militaries confront rapidly evolving crises almost daily. In the theatre of a combat situation there are logistical, personnel and time critical decisions that need to be made to attain the end goal. We have explored a number of approaches taken by military organisations globally and examine how the approaches may be utilised to aid surgical crisis manage-ment. As such, the militaries around the world have enshrined crisis management within their doctrine. One example being the UK Ministry of Defence Joint Doctrine Publication 01, UK Joint Operations Doctrine that devotes a significant proportion of its prose to Crisis Management [11]. Crisis management philosophy is interwoven throughout this doc-ument with Crisis response examined in relation to National Process including their stra-tegic structures and mechanisms for decision-making and crisis management, opera-tional level planning and latterly the command process.

The military response to the Covid crisis in the UK perhaps demonstrates the efficacy in which the military can respond to a new and unforeseen problem by following set pro-cesses. This has been demonstrated by the logistical support provided by the military in the construction and opening of the NHS Nightingale hospital in London, a 4000-bed critical care unit – although the latter was not used signifi-cantly during the first wave of the crisis.

Having a codified crisis management plan set out for a national organisation, which takes into account international actors allows a calm construction of a specific plan using a familiar set framework using universally understood language in the organisation setting. As surgeons and healthcare professionals we might learn from this example. National bodies and specialist societies could collaborate to produce a standardised surgical cri-sis management framework which could be manip-u-lated and shaped to fit an individual crisis.

8. Operational planning – an integrated approach

The military command structure is designed to handle issues that represent a very real danger and that escalate at an enormous and unpredictable pace, as such efficiency of decision making and communi-cation are paramount. Hierarchical planning is seen as an important aspect within military organisational management. Bold leadership and deci-sive action are seen as vital attributes when time is short, pressure great and the stakes high. In military crisis management, hierarchy is designed with the operational level at its peak. The operational level is defined as the level of operations at which campaigns and major operations are planned, conducted and sustained to accomplish strategic objec-tives within theatres or areas of operations. The scale and level of command at the op-erational level is not pre-defined but assumes a size and shape that meets the demands of the specific operation. A set planning structure is key prior to and throughout a crisis, the military have three set questions which must be addressed during operational planning as part of crisis man-agement and resolution (Box 1).

This simple planning structure could be eminently transferable to the discipline of surgery and healthcare in general and takes into a count the dynamic nature of a crisis allowing development of scenarios which may or may not take place.

9. Multi-institutional working

Fitting within other frameworks be they local, regional or national is vital during a crisis as it ensures everyone is speaking the same language, aids communication and allows con-tinuity of process. The UK military crisis management doctrine fits in with NATO opera-tional planning and crisis management doctrine, this allows a near seamless transition be-tween smaller and larger institutions. This could be replicated between crisis manage-ment planning at individual surgical unit or regional level and national crisis management doctrine in healthcare. Hence the model can be scaled from single departmental units, to regional surgical groups to national healthcare policy groups.

During crises operational planning becomes hugely important espe-cially, when in the surgical situation, there are likely to be multi-institutional interests. The model in Fig. 4 is a modification of the models of integrated planning at operational level adapted from the UK JDP 01 [11]. Here we see how different units or organisations poten-tially interact and demonstrate how a coordinated approach across healthcare with a central crisis management plan can interact with smaller special interest and speciality units. This high-lights a need for a permanent framework in place from the top of the hierarchy. This model is also applicable to smaller departmental sub-units within a hospital with an over-arching crisis management policy devised and held by the
hospital executive team.

There are numerous other lessons we, as surgeons, could take from this military approach especially military models which have already been adapted for the business market. A number of parallels have been drawn between military and business crisis management and this analogy may be taken one step further into the surgical field. Yuval Atsmon and his colleagues at McKinsey & company examine such concepts further in their article that promotes a military structured response to crisis in business [12]. There are many parallels to the surgical community and lessons can be learnt from this. They drew three main insights from military crisis management that would benefit the business community. These insights in business are also, we believe, pertinent in a resilient surgical response to crisis. Firstly, they identified that organisations should adopt a military-command structure with a view to help reduce confusion and enable faster, better decision making in an organisation. Secondly, management should be simultaneously across all “time horizons” based on an integrated, strategic crisis-action plan in order to reduce chaos and accelerate decision making [13]. Thirdly, that age-old principles of war can help keep an organisation focused and motivated, improving its chances of achieving objectives.

10. Multiple task specific teams

We have discussed a military command structure in relation to the operational level and hierarchy above, Atsmon and colleagues explore this concept further and describe the use of multiple teams with specific designated tasks in relation to the crisis as opposed to all being handled by a single committee. These multiple teams feed into the hierarchy to operational level. Such teams will have specific purposes and during the crisis process new teams should form and others disband. Four essential areas are covered by these teams a simplified model of their roles and functions are shown in Fig. 5.

Although the military is a structure dependent on hierarchy, it does in fact have a decision-making structure that is very flat. One example is that a commander sets a direction, expressing their intent to the organisation, they then rely upon junior colleagues to make reasoned and mature judgments based on the information they receive. Surgery, like the military has barriers associated with hierarchy however delegation of tasks to junior colleagues not only will improve their professional development but also will facilitate a shared workload and may also allow an improved dialog to generate more radical ideas.

New information in a crisis is often overwhelming, evolving and expansive. Communication of such information traditionally occurs in a top-down fashion; this can lead to information overload and confusing and contradictory messages especially if the relaying of information is not timely. The model above allows information to be cascaded to the appropriate team to action and as such ensure the right information, goes to the right individuals in a timely and efficient manner enabling a focussed and expert response with appropriate feedback.

11. Development of plans over the “time horizon”

Here we present a further example by Hirt, Atsmon and colleagues where a planning matrix was derived from the military format. Here we

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Box 1

Questions to be answered when planning for a crisis [8].

1. What are the features of the current (crisis) situation?
2. What should the (more favourable) situation look like at the end?
3. How should the situation change or be changed?

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Fig. 4. Working within a multi-institutional hierarchical framework.[11].
can see how crisis management planning should be multidimensional looking at concepts which have arisen from the crisis, how these concepts have developed, how data and feedback are extracted and what the outcomes may be. This matrix plots these events and triggers over a time period allowing a structured approach to the crisis management (see Table 1) [9,10].

13. Discussion

13.1. Evaluating the models

Two approaches to crisis management have been described; both have merits as well as disadvantages. Table 2 summarises the major strengths and weaknesses of each model described and provides a rating of suitability for use by the surgical leader.

As shown above each model has certain benefits and drawbacks, however the models share a number of themes. The RRT model describes the time frames of crisis and like the military model takes the resilient surgeon leader from the point of crisis through to the horizon. Both models provide an excellent generic structure from which a response to any potential crisis can be made. Both are relatively simplistic and reproducible and undoubtedly both are transferable to a multidisciplinary healthcare model. Psycho-logically the approach is not alien to surgeons whom by the very nature of their daily practice encounter crisis but both allow expansion on traditional concepts and facilitate the approach when a crisis extends beyond their usual bounds of practice. Both models share the concepts of agility, resilience and subsequent antifragility. Understanding these concepts is key. Crises often progress at a high tempo and the resilient surgical leader must be equipped with the skills to make difficult, contentious and controversial decisions. Team support and collective responsibility breed antifragility and subsequent stability and these qualities must be fostered. This approach is exemplified by the crisis response of the Pan London Emergency Cardiac Surgery service [14], who’s approach was more akin to the military model. Its command structure is exemplary with services coor-dinated from a lead clinical centre coordinating regional units and fits within the model of multi-institutional hierarchy. Two-way communication and continuous dialog up down and across the hierarchy have been lynch pins of success in this approach. The adoption and exploitation of new technology such as telemedicine is key to success and mainte-nance of the elective workload. As with the response of Evans et al. described earlier, we have seen collaboration between private and government partners to maintain service delivery [7,12].

Flexibility and pragmatism are key, when using models, despite in built elasticity within these models it is human nature to respond with rigidity. There is a danger in both these models of falling into the trap of protocolisation as there is no in-built safeguard against this. Both models perhaps fail to promote true innovation, interestingly the approach to hierarchy within the military model perhaps has advantages at this point as it promotes delegation to potential new talent, where decision making is centralised but ideas and innovations are developed at a “specialist junior” level and fed to the central leader.

We feel a deficit lies in both models with the lack of inclusion of evolving technologies with neither model truly embracing the virtual environment. This is increasingly important and we will be more reliant on this as technology improves. Data are vital in reducing ambiguity, but mass data can also compound ambiguity too. We believe that an evolving crisis response model should include methods for filtering and assimilating data. Machine learning and artificial intelligence should be
Table 1
Hypothetical strategic management crisis management in surgery viewing events up to the “time horizon” based on the model presented by Atsmon and colleagues [9,10].

| Time          | Week 0 | 2–4 | 3–6 months | 1–2 years | New Normal |
|---------------|--------|-----|------------|-----------|------------|
| Starting position Baseline and crisis context | Outpatient clinics and elective operating stops | Growing non-treated elective workload | Assessment of circumstances – “clinical liquidity position” | Return of capacity Firms establish- ment of protocols | Current working paradigm – challenged post crisis requiring per- service change of clinical approach |
| Operating lists cancelled | Operating list transition to virtual consultation environment | Preparing for staff re-deployment/absence | Staff and oper- ators re-deployed with ICT solutions | Staff risk | Staff are reassigned to resettle patients in the centre |
| Scenarios (issues and opportunities) | | | | | |
| Ward closures | Staff absences | Staff returning to work | Staff absences | Staff absences | Staff absences |
| Anaesthetists, surgeons and ITU support | Anaesthetists, surgeons and ITU support | Anaesthetists, surgeons and ITU support | Anaesthetists, surgeons and ITU support | Anaesthetists, surgeons and ITU support | Anaesthetists, surgeons and ITU support |
| On-going emergency workload | On-going emergency workload | On-going emergency workload | On-going emergency workload | On-going emergency workload | On-going emergency workload |
| 6 weeks to resume care | 6 weeks to resume care | 6 weeks to resume care | 6 weeks to resume care | 6 weeks to resume care | 6 weeks to resume care |
| Strategic moves (options, safety nets, and no-regrets moves) | | | | | |
| Stop all but emergency surgery | Assess risk to surgical patients | Assess risk to surgical patients | Assess risk to surgical patients | Assess risk to surgical patients | Assess risk to surgical patients |
| Assess risk to surgical staff | | | | | |

Table 1 (continued)

| Time          | Week 0 | 2–4 | 3–6 months | 1–2 years | New Normal |
|---------------|--------|-----|------------|-----------|------------|
| adequate supplies of PPE are ordered | Seek centralised funding for new system | Implemented ICT solutions re-mote MDs | More efficient work stream harnessing new technology | Testing efficiency allows stream-lined service | More efficient patient pathways |
| ICT solutions to shut down services | | | | | |
| Workforce allocation | | | | | |
| Trigger points | | | | | |
| Fewer operative resources | Analyse current position and assess “liquidity” | Analyse current position and assess “liquidity” | Analyse current position and assess “liquidity” | Analyse current position and assess “liquidity” | Analyse current position and assess “liquidity” |
| Progressive disease | | | | | |

In business the liquidity position describes the difference between the sum of both liquid assets and incoming cash flow on one side and outgoing cash flows from existing commitments. Clinically this could be metaphorically related to the difference between availability of resources (beds, staff, operative equipment and facilities) and current clinical burden e.g., surgical waiting list length, emergency workload and burden of disease progression.

b We can class patients who have attended screening, are symptomatic or on the waiting list as “known”. There may be a significant number of patients who due to the crisis failed to attend screening, have not presented to hospital with symptoms etc. And these could be classed as unknown – uses of AI and data science may be able to pre-dict this population number.

![Fig. 6. A simplified four quadrant approach to crisis management.](image)

Embraced as well-designed systems with validated algorithms will aid decision-making and help determine an action response whilst testing scenarios.

Atsmon, in his teams’ approach to crisis management, demonstrates...
that models can be taken from other philosophically different organisations and utilised in new arenas. We therefore believe that aspects of both models can be applied in a crisis but flexibility, the unpredictability of clinical practice and restricted resources must be considered. A successful model will be pragmatic, adaptable and be self-defensive. Future models must embrace the virtual environment and utilise AI however we must also accept that this too comes with restrictions of domain requirements and reliance on other factors of function and capability which lie within the remit of other sectors.

14. Approaching surgical crisis management in the geopolitical environment

We have described models from both industry and the military, both these sources share attributes whilst adding in unique perspectives on the approach to crisis manage-ment. One critical aspect of crises such as the Covid 19 pandemic is their global effect and implications. We must approach such problems in a three-tiered approach as iso-lationism does not breed resilience and will breed failure. Here we propose the follow-
ing approach to the global crisis based on the models above.

15. International level response

The onus lies with international organisations including the WHO Global Surgery with assistance from bodies such as the Lancet Com-mission on Global Surgery to help en-sure strategies are in place at a global level. Learned bodies with an international pres-ence such as the American college of Surgeons or various Royal Colleges of Surgeons in the UK and Ireland, all of which have a broad international membership, also have a responsibility to ensure strategies are in place to help their members and fellows coordi-nate responses to crisis on at the inter-
national/national interface. Such an example would be the International Mission on Global Surgery to help en-
sure strategies are in place at a

national level with assistance from bodies such as the Lancet Com-
mittee.

| Model | Benefits | Drawbacks | Rating |
|-------|----------|-----------|--------|
| Deloitte Model Renjen et al.[5, 6,11] | Clear roadmap | Can be become overly complicated | * |
| UK Military Model JDP 01 (8) | Conceptually easy to implement | Limited focus on technology and artificial intelligence | ** |
| McKinsey Model Atsmon et al.(9) Hirt et al.(10) | Explores the entire timeframe of crisis | Difficult to enact on global level | *** |
| | Builds on established successful models | Does not exploit the benefits of advancing technology | |
| | Simple and transferable concepts | |
| | An exemplar of building upon earlier success by other organisations | |

16. National level response

More complicated models can be introduced at national level but of course there is a necessity to fit into the global picture as described above. National surgical organisations can adopt a more complicated strategy similar to what is described within the time hori-zon model. This may vary from specialty to specialty but should provide a clear and simple strategy which is both flexible, testable and reproducible. Man-
agement of hierar-chy will be key at national level and a centralised unit should be in place with a nominated quasi political figurehead, e.g., College President, chairing major decisions within a man-ageable yet diverse committee. Small sub committees must feed into this process acting as operations, insights, communication and plan ahead teams [11]. Needless to say, these teams should not solely consist of surgeons but colleagues from communication teams, nursing and paramedical teams and public involvement. Multiple committees are already in place for other purposes and a policy which allows immediate repurposing of such committees to new roles within the crisis hierarchy are paramount.

17. Regional and local level response

We have seen how interaction is best served from communication both up and across the hierarchy. Following a set plan described above mean that a familiar and reproducible process is in place which organi-

cations can follow. At regional and local level comes perhaps the hardest challenge as it is here where generalisability is lost and the need to address minuitae appears. However, the process and models remain the same and the same questions are asked. The Time Horizon concept allows a detailed plan to be drawn up and communicated up the line in a set format to those at national and international level. This allows exemplary plans to be shared and assistance offered those struggling to innovate. A local crisis hierarchy should be set up again with a commit-

tee structure described above. Training committees and regional MDTs may provide a prefabricated populated committee which could once again be repurposed at a moment’s notice. Con-cerns could be fed into this by colleagues in de novo sub committees which wax and wane in size and existence depending on the crisis.

18. Managing escalation

One concept of crisis management which is important but not addressed fully by these models is escalation. Both these models rely on institution in a timely manner. Change is always incremental and knowing when to intervene is both a complex, contro-versial and chal-

lenging decision. Early intervention may have a detrimental impact on patient care, financial through put and collegiate support conversely, late intervention could lead to complete collapse of service and may have catastrophic outcomes for the patient pop-u-lation. A transferable graphical representation can be derived from Buron and Curtis’ “anx-

iety escalation curve” (15), Fig. 7 contextualises this in the surgical crisis environ-

ment.

This approach allows conceptualisation and communication of a controlled response, visualisation of escalation helps colleagues and managers to understand the decision process and defining a locus upon the scale realises the situation. The aim is to institute an early response and exit the crisis curve as shown in the figure.
19. Evaluating the crisis management response in surgery

As we pass through from the second phase of the current international crisis we should prepare for the next. Not knowing what this will be we should set out a generic structure to support antifragility and resilience when such a crisis appears. Eventual warning to others and rehabilitation are the lessons for the next pandemic. A successful leader must both learn from both their successes and failures. New knowledge gained from a crisis should be applied scientifically and logically to help shape and adapt on going systems for the better. Re-evaluation and governance mechanisms should be formulated to audit and assess any adaptations and practices should evolve accordingly in an evidence-based manner.

We have described models from two very different organisation types above, we have also seen how private industry has sought to learn lessons from military crisis management. These models are by no way a panacea to a crisis and each has its own inadequacies however our approach demonstrates how a surgical leader must explore novel and established models selecting elements which augment their leadership approach and allow a pragmatic and evolving response. We too can learn lessons as surgeons from these models and we believe that by have a standardised structured response for crisis management in surgery at multiple levels within the organisations we can provide better care for our patients in future.

20. How to assess and appraise the situation

We’ve demonstrated models and in part justified their applicability to surgery but we have not addressed appraisal and feedback fully. It is, in crisis, important to utilise resources which are already in place and here. It is vital in crisis management that managerial structures are elastic and dynamic and can both identify and respond to the evolving situation. During a crisis we will see moments of failure, where we miss the mark and fail to achieve the goals we set, we will also however, see moments of excellence and take-home lessons from both. Identify and learning from both excellence and failure are vital and use of online reporting tools feeding back centrally can be of assistance e.g. Learning from Excellence (LfE) (https://learningfromexcellence.com) providing both a structured and standardised feedback system and also a framework which is positive rather than punitive.

21. Limitations

We have, in our opinion selected the models we think will fit the surgical environment best, we do however accept there are other models which are applicable. Our review here is narrative and not exhaustive in its nature and recommendations drawn from here are of course open to debate. Refinements of these tools are required to integrate them fully into the healthcare model but we regard this a starting point upon which to build.

22. Conclusion

Crises are by their very nature unpredictable entities; despite warnings we never expected an infectious pandemic to impact so greatly on our practice as surgeons. We were somewhat caught out by events but a response to the challenge has brought about more successes than failures. It is important to recognise that unlike war or aspects of a financial crisis; disease does not recognise constraints such as geopolitical borders. This leads to greater uncertainty as it spreads through differing cultural and economic spheres. As such, strategies to manage a surgical or public health crisis of this magnitude should be generic, affordable and adaptable providing a scaffold on which local institutions can build pragmatically. Crisis breeds innovation and advancement and provides impetus. The principles we propose are, universal and a promotion of a generic stand-ardisable format which surgeons can follow to avoid being unprepared when the next crisis ultimately appears, no matter what that may be.
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Author contribution

Edward T Pring – Concept development, Study Design; research of models and review of data, writing of manuscript.

Georgios Malietzis – Concept development, Study Design; research of models and review of data, writing of manuscript.

Simon Kendall – Review of manuscript, advice on models and applicability to surgeons, writing and editing.

John Jenkins – Review of manuscript, advice on models and applicability to surgeons, writing and editing.

Thanos Athanasiou - Concept development, Study Design, development of models, writing, editing, senior author.

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All data used in this review are readily available online and can be accessed by following the relevant references at the end of the article.

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None.

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References

[1] G. Meccariello, O. Gallo, What ENT doctors should know about COVID-19 contagion risks, Head Neck (April) (2020) 1248–1249.
[2] T. Cook, E. Kursumovic, S. Lennane, Exclusive: deaths of NHS staff from covid-19 analysed [Internet], Health Serv. J. (2020 Apr). Available from, https://www.hsj.co.uk/exclusive-deaths-of-nhs-staff-from-covid-19-analysed/7027471.article.
[3] B. Obama, Remarks by the President on Research for Potential Ebola Vaccines [Internet], The White House Office of the Press Secretary, 2014 [cited 2020 May 28]. Available from, https://obamawhitehouse.archives.gov/the-press-office/2014/12/02/remarks-president-research-potential-ebola-vaccines.
[4] A. Sage, Coronavirus: France’s Facemask Fiasco Burns Deep for Macron [Internet], The Times, 2020 May 27. Available from, https://www.thetimes.co.uk/article/coronavirus-frances-facemask-fiasco-burns-deep-for-macron-kb1bdo657.
[5] P. Renjen, The Heart of Resilient Leadership Responding to COVID-19 [Internet], Deloitte Insights, 2020 Mar;1–24. Available from, https://www2.deloitte.com/global/en/pages/about-deloitte/articles/the-heart-of-resilient-leadership.html.
[6] P. Renjen. The Essence of Resilient Leadership: Business Recovery from COVID-19, vols. 1–18, Deloitte Insights, 2020.
[7] S. Evans, C. Taylor, A. Antoniou, T. Agarwal, E. Burns, J.T. Jenkins, et al., Implementation of a clinical pathway for the surgical treatment of colorectal cancer during the COVID-19 pandemic, Colorectal Dis. 22 (9) (2020) 1002–1005.
[8] [Internet], JDP01, Developments Concepts and Doctrine Centre Ministry of Defence, HM Government, UK. Joint Doctrine Publication 01 UK Joint Operations Doctrine Joint Doctrine Publication 01 (JDP 01), 2014 [cited 2020 Oct 14]. Available from, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/389775/20141209-JDP_01-UK_Joint_Operations_Document.pdf.
[9] Y. Atsmon, D. Chinn, M. Hirt, S. Smith, Lessons from the Generals: Decisive Action amid the Chaos of Crisis, McKinsey Co, 2020. ;1(May).
[10] M. Hirt, S. Smith, C. Bradley, R. Uhlane, M. Mysore, Y. Atsmon, et al., Getting Ahead of the Next Stage of the Coronavirus Crisis [Internet], McKinsey Co, 2020; (April)1–11. Available from, https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/getting-ahead-of-the-next-stage-of-the-coronavirus-crisis.
[11] P. Renjen, The Essence of Resilient Leadership [Internet], Deloitte Insights, 2020; maj1–17. Available from, https://www.forbes.com/sites/deloitte/2020/06/31/lessons-from-the-pandemic-on-how-to-break-down-organizational-silos-and-optimize-workforce-potential/#520b888c65.
[12] A. Hussain, D. Balmforth, M. Yates, A. Lopez-Maro, C. Rathwell, J. Lambourne, et al., The Pan London emergency cardiac surgery service: coordinating a response to the COVID-19 pandemic, J. Card. Surg. 35 (7) (2020) 1563–1569.
[13] J. Butler, C. Finley, C.H. Norell, S. Harrison, H. Bryant, M.P. Achiam, et al., New approaches to cancer care in a COVID-19 world, Lancet Oncol. 21 (July) (2020) e339–e340.
[14] The Lancet Oncology, Safeguarding cancer care in a post-COVID-19 world, Lancet Oncol. [Internet] 21 (5) (2020) 603, https://doi.org/10.1016/S1470-2045(20)30243-6. Available from.
[15] K.D. Burton, M. Curtis, The Incredible 5-Point Scale: the Significantly Improved and Expanded [Internet], second ed., AAPC Publishing, Swannee, 2012. Available from, www.aapcautismbooks.com.