Activating a large foreign outpatient facility using a systems-based approach to dry runs

Received (in revised form): 16th September, 2021

Hugo Pariseau

Department of Management Engineering and Consulting, Mayo Clinic, USA

Hugo Pariseau is a Health Systems Engineer in the Department of Management Engineering and Consulting (ME&C) at Mayo Clinic. He began his career with Mayo Clinic and ME&C in 2017 and has since worked on a variety of projects impacting multiple sites and functions. Originally an Associate in the Fellowship Program on the Arizona campus, Hugo gained early experience working on staffing-to-workload and surgery scheduling optimisation projects. Upon relocating to Rochester in 2018, Hugo became involved in revenue model innovation initiatives before joining the ME&C team supporting the activation of Sheikh Shakhbout Medical City (SSMC) in Abu Dhabi. Following the activation of SSMC, he remained engaged in international projects for both SSMC and Mayo Clinic Healthcare-London, where he partnered with executives on engagements ranging from strategy to execution. Hugo holds a Bachelor of Science degree in Biomedical Engineering from Texas A&M University and a Master of Science degree in Finance from Vanderbilt University.

Department of Management Engineering and Consulting, Mayo Clinic, 200 First St. SW, Rochester, MN 55905, USA
Tel: +1 507 284 2511; E-mail: hugo.pariseau@gmail.com

Nahed Balalaa

General Surgery, Sheikh Shakhbout Medical City, United Arab Emirates

Dr Nahed Balalaa, MBBCh, EMHCA, is a Consultant Breast Surgeon at Sheikh Shakhbout Medical City (SSMC), where she serves as director of the outpatient department. She has extensive experience implementing strategies to improve and expand services while working to enhance customer access and satisfaction. Dr Balalaa has leadership experience in education and clinical practice and is actively involved in teaching, course design and research. She serves as a core faculty member in the General Surgery Residency Programme and as a member of several multidisciplinary subcommittees. During the activation of SSMC in 2019–2020, she was the physician lead for the activation of outpatient services. Dr Balalaa graduated from Dubai Medical College in the UAE and completed her MRCS with The Royal College of Physicians and Surgeons in Glasgow, UK. After completing her Arab Board and General Surgery Residency Programme, she was appointed the Administrative Chief Resident. She then completed her European Board of Surgery in Breast Surgery (EBSQ) in Belgium. Dr Balalaa obtained her Executive Masters in Health Care Administration (EMHCA) with distinction from Zayed University in partnership with University of Houston - Clear Lake and the University of North Carolina at Chapel Hill.

Sheikh Shakhbout Medical City, PO Box 11001, Abu Dhabi, United Arab Emirates
Tel: +971 2 314 4444; E-mail: nbalalaa@ssmc.ae

David M. O'Brien

Department of Management Engineering and Consulting, Mayo Clinic, USA

David M. O'Brien is a Senior Health Systems Engineer in the Department of Management Engineering and Consulting (ME&C) at Mayo Clinic. He has more than 5 years' experience in leading clinical teams developing telehealth solutions and direct-to-consumer healthcare products and services, and he provides business and strategic consulting assistance to durable medical equipment providers. Before joining ME&C, David was a Laboratory Technologist Resource Coordinator at Mayo Clinic Laboratories,

providing laboratory testing support and on-site workflow design and consulting services to over 70 referral laboratory clients. He has a master's degree in Business Administration from St. Thomas University, St Paul, Minnesota.

Department of Management Engineering and Consulting, Mayo Clinic, 200 First St. SW, Rochester, MN 55905, USA
Tel: +1 507 284 2511; E-mail: obrien.david@mayo.edu

Naser Ammash

Chief Executive Officer, Sheikh Shakhbout Medical City, United Arab Emirates

Dr Naser Ammash, MD, has been Professor of Medicine, Mayo Clinic College of Medicine, and Consultant in the Cardiovascular (CV) Department at Mayo Clinic, Rochester, since 1995. Dr Ammash is the current CEO of Sheikh Shakhbout Medical City (SSMC), a joint venture between Mayo Clinic and the Abu Dhabi health authority. He was one of the physician leaders responsible for the successful activation of SSMC. Dr Ammash is the immediate past Practice Chair of the CV Department at Mayo Clinic Rochester and served as Chair of the CV Clinical Practice Committee for Rochester and the Mayo Clinic enterprise (2014–2018). In that role, he oversaw and directly managed the restructuring of the inpatient and outpatient practice into an integrated patient-centric, disease-orientated, at times multispeciality, team-based service. Dr Ammash is board certified in cardiovascular diseases, with subspeciality certification in Adult Congenital Heart Disease and Echocardiography. He attended the American University of Beirut-Lebanon and moved to the United States in 1987. Dr Ammash currently serves on the American Board of Internal Medicine test approval committee for the cardiovascular board after being a member of the testing writing committee for the board certification examination until 2019. He has published more than 150 peer-reviewed articles and book chapters in addition to being an invited speaker at numerous national and international continuous medical education meetings, including many in the Middle East and Gulf regions.

Sheikh Shakhbout Medical City, PO Box 11001, Abu Dhabi, United Arab Emirates
Tel: +971 2 314 4444; E-mail: nammash@ssmc.ae

Matthew Gettman

Chief Medical Officer, Sheikh Shakhbout Medical City, United Arab Emirates

Dr Matthew Gettman, MD, is the Erivan K. Haub Family Professor and Chief Medical Office at Sheikh Shakhbout Medical City. He also serves on the Clinical Practice Committee — International. Dr Gettman started the robotic surgery programme at Mayo Clinic in 2002. He has co-authored over 200 manuscripts and book chapters. He received the Smith Award from the Endourological Society in 2011 and the Platinum Award from the European Association of Urology in 2016. He serves on the editorial board for European Urology and Journal of Urology and is Section Editor of Mayo Clinic Proceedings. His current research interests include robotics, minimally invasive surgery, telemedicine, prostate cancer and regenerative medicine.

Sheikh Shakhbout Medical City, PO Box 11001, Abu Dhabi, United Arab Emirates
Tel: +971 2 314 4444; E-mail: mgettman@ssmc.ae

Muna Khan

Department of Systems, Procedures, and Planning Services, Sheikh Shakhbout Medical City, United Arab Emirates

Muna Khan serves as the Director of Strategy and Planning Services at Sheikh Shakhbout Medical City (SSMC) in Abu Dhabi. He has been part of Mayo Clinic for over 21 years, where he has led several strategic initiatives for the organisation. Muna served as a voting member of the Electronic Health Record and Revenue Cycle Management Selection Committee. He also led the management consulting team that activated SSMC. Muna previously served as the President of the Health Information Management Systems Society, Minnesota Chapter. He has an MBA from the Carlson School of Management in Strategic Management and an MPH from Emory University.

Department of Systems, Procedures, and Planning Services, Sheikh Shakhbout Medical City, PO Box 11001, Abu Dhabi, United Arab Emirates
Tel: +971 2 314 4444; E-mail: munawwarkhan@ssmc.ae

Abstract The value of dry runs as a tool to assess operational readiness when activating healthcare facilities is well documented. However, this paper analyses how the application of this tool is often limited to isolated teams or processes. The paper describes how, 2019, Mayo Clinic was engaged in a consulting capacity to activate a large healthcare facility in the Middle East. A short activation timeline and limited staff exposure to the new facility meant there was a need to conduct a systematic assessment of operational readiness. The systems-based approach to scenario development and dry run execution relied on the involvement of 28 outpatient specialties and 16 support functions. These teams collectively executed dry runs for 74 integrated scenarios and actively participated in the resolution of findings. Integrated scenarios served to validate operations at a systems level, while team-specific scenarios served as supplemental validation for isolated processes. Dry runs exposed a total of 231 findings. High, medium and low priority findings made up 36%, 42% and 22% of total findings, respectively. Prior to activation, 75% of findings were resolved, 9% were no longer applicable and 16% were prioritised as post-activation projects. During activation, no serious patient safety, regulatory or compliance issues were reported, and no major security events occurred. This is evidence that dry runs were successful in exposing latent gaps in workflows; training and education; and infrastructure, equipment, supplies and technology.

KEYWORDS: activation, in situ simulation, simulation, dry run, interdisciplinary, commissioning

INTRODUCTION

The concept of using high-fidelity in situ simulations, also known as dry runs, to prepare for the opening of new healthcare facilities is well established.[1–3] In 2019, Mayo Clinic was engaged in a consulting capacity to activate Sheikh Shakhbout Medical City (SSMC), a new medical centre in Abu Dhabi, United Arab Emirates (UAE). With 741 beds and a connected multilevel outpatient facility, SSMC is one of the largest medical centres in the UAE. The activation of SSMC relied on the near-complete transfer of services and staff from Mafraq Hospital, a community hospital located on an adjacent property. While the scope of the activation was limited to existing services, moving into a new facility introduced a considerable amount of change and ambiguity.

An essential component of activation preparation activities was the planning and execution of dry runs. To lead this effort, the Department of Management Engineering and Consulting (ME&C) at Mayo Clinic assigned five health systems engineers (HSEs) and one project manager to complement a multidisciplinary team of leaders from Mafraq Hospital and Mayo Clinic. This group collaborated to develop a framework that would leverage dry runs as a tool to assess operational readiness from a systems perspective. While this framework was used to prepare for the activation of SSMC as a whole, the scope of this paper is limited to the application of dry runs in the outpatient setting. The entirety of this work, from planning to execution, adhered to an expedited timeline that began in August of 2019 and concluded less than four months later in November.

The primary goal of dry runs was the validation of systems and procedures in a low-risk, high-fidelity environment. This aim guided the use of a novel methodology that emphasised the multidisciplinary development of integrated scenarios and execution of dry runs. Another important goal of dry runs was to maximise the opportunities for staff to familiarise themselves with the new facility prior to activation while simulating complex

and challenging scenarios. The fulfilment of these goals directly translated into the exposure and subsequent resolution of latent gaps in workflows; training and education; and infrastructure, equipment, supplies and technology.

METHODS

Scenario development

All 44 activation teams (28 outpatient specialties and 16 support functions) were tasked with generating scenarios (Figure 1). Workshops were administered by ME&C HSEs to communicate expectations and guidelines to activation team leaders. Scenario selection was guided by the Pareto principle (80/20 rule) and the desire to test high-risk events, including emergency codes. A custom template was created and distributed to standardise scenario development. Important template fields included set-up (necessary equipment, supplies and technology), required training and education, process owners and

Wave	Outpatient Specialities (Vertical Teams)
1	Cardiology
1	Gastroenterology
1	Neurology
1	Ophthalmology
1	Otolaryngology
2	Endocrinology
2	General Surgery
2	Infectious Diseases
2	Internal Medicine
2	Nephrology
2	Pulmonary/Sleep Disorder
2	Urology
3	Dermatology
3	General Paediatrics
3	Hematology/Oncology
3	Neurosurgery
3	Oral and Maxillofacial Surgery
3	Orthopaedic Surgery
3	Paediatric Cardiology
3	Paediatric Endocrinology
3	Paediatric Neurology
3	Paediatric Rheumatology
3	Paediatric Surgery
3	Plastic Surgery
3	Physical Medicine and Rehabilitation
3	Rheumatology
3	Vascular Surgery
4	Obstetrics and Gynaecology

Wave	Support Functions (Horizontal Teams)
NA	Access Management
NA	Anesthesiology/Surgical Services
NA	Dietetics
NA	Facilities/Biomedical Engineering
NA	Finance
NA	Human Resources
NA	Information Technology
NA	Laboratory
NA	Nursing
NA	Operations Support Services
NA	Pharmacy
NA	Public Affairs/Communications
NA	Quality and Patient Experience
NA	Radiology
NA	Supply Chain/Materials Management
NA	Training and Education

Figure 1: Activation team structure. Outpatient specialties (organised by dry run wave) and support functions combine to create a matrix where the intersections of vertical and horizontal teams represent opportunities to assess operational readiness. NA, not applicable.

desired outcomes as defined by those owners. Desired outcomes were listed alongside each process step and marked as fulfilled by assessors during dry run execution.

Once scenarios were submitted, HSEs led an exercise to incorporate scenarios developed by horizontal teams (support functions) into scenarios developed by vertical teams (outpatient specialties). The resulting scenarios were considered *integrated*. Scenarios not included in this integration exercise were considered *team specific*. All scenarios were reviewed for conceptual fidelity by subject matter experts from Mafraq Hospital and Mayo Clinic.

> The following example is a simplified narrative-only version of an actual integrated scenario. As described previously, scenario scripts are documented in a much more granular, step-by-step manner alongside desired outcomes.
>
> Integrated Scenario Example: Accompanied by a home care nurse, a stretcher patient arrives by ambulance at SSMC for a scheduled outpatient appointment. On arrival, the patient is guided to the appropriate outpatient wing, where they use SSMC's queue management system to initiate the registration workflow. The patient waits in a designated stretcher holding area until a nurse arrives. At that time, the patient has a complication with their tracheostomy and starts to choke. The nurse attends to the patient using a portable suction machine and then quickly transfers them to an outpatient treatment room. Vitals are obtained and documented in the EHR. The physician performs a physical assessment and then places orders for additional labs, radiology, pharmacy, take-home consumables and a follow-up appointment. A journey sheet is filled out by the physician to direct the patient as they complete the remainder of their appointment sequence. On completion of all components of their visit, the patient returns to the ambulance bay for pickup.

A matrix-based audit was performed to ensure that integrated scenarios would collectively validate common interactions between vertical and horizontal teams. Figure 2 illustrates a conceptual example of this audit by indicating which horizontal teams are implicated in each integrated scenario. The resulting visualisation enables the team to quickly gauge the adequacy of integrated scenario coverage and adjust scenario scripts accordingly. This approach to scenario development is what makes the methodology novel.

Dry run planning and scheduling

The planning of dry runs was facilitated by a coordination team. This multidisciplinary team was composed of physician, nursing, quality and operations support services representation from Mafraq Hospital and Mayo Clinic. Core responsibilities of the team included promoting environmental fidelity, reviewing workflows, scheduling and debriefing.

Scenarios involving new workflows were subjected to preliminary tabletop simulations at the discretion of scenario owners. The purpose of these tabletop simulations was to validate new workflows at a conceptual level with all participants before being executed in situ.

Part of the planning process was ensuring certain prerequisites were met. While in situ simulations are often used as vectors for training and education,[4,5] the primary objective was to validate systems and procedures. Therefore, activation teams were asked to complete all training, education and orientation prior to dry run execution. Additionally, facility construction had to be completed, materials stocked and equipment/instrumentation procured, installed and validated. The information technology (IT) team was engaged to establish a virtual electronic health record environment with test patients so that IT processes, such as orders, could also be validated in the new facility. The fulfilment of these prerequisites was the responsibility of individual activation teams.

	Outpatient Specialties (Vertical Teams)	
Support Functions (Horizontal Teams)	**Example 1: Orthopaedic Surgery**	**Example 2: Gastroenterology**
Access Management	X	X (2)
Anesthesiology/Surgical Services	X (3)	X
Dietetics		X
Facilities/Biomedical Engineering	X	X (2)
Finance	X (2)	
Human Resources		
Information Technology	X	X
Laboratory		X (2)
Nursing	X	X
Operations Support Services	X	
Pharmacy	X	X
Public Affairs/Communications		
Quality and Patient Experience	X	X
Radiology	X (3)	
Supply Chain/Materials Management	X	X
Training and Education		X

Figure 2: Matrix-based audit tool for integrated scenarios. This figure serves as a simple conceptual example of the tool used to conduct an audit on integrated scenario coverage for interactions between vertical and horizontal teams. Numbers in parentheses indicate more than one interaction across different scenarios.

Several considerations informed the approach to dry run scheduling. There was a conscious effort to minimise the impact on patient care at Mafraq Hospital, which remained operational throughout dry runs and until the activation of SSMC. Conducting dry runs at the new facility took participants away from work. Staff members belonging to the same functional teams participated in dry runs on a rotating basis to maintain coverage at the old facility. Staff exposure to the new facility was promoted by encouraging new participants for each dry run. This also maximised the ability to validate staff training and education. The execution of dry runs was separated into four waves that mirrored the four activation waves with respect to team involvement (Figure 1).

Dry run execution

Each dry run was prefaced by a short briefing session administered by the physician chair of the outpatient department. The purpose of this briefing was to motivate participants and remind them of essential dry run goals. Dry runs were shadowed by quality staff, clinical subject matter experts and HSEs, who collectively served as assessors. The primary responsibility of assessors was to evaluate the fulfilment of desired outcomes for each process step as defined by process owners. The secondary responsibility of assessors was the general validation of facilities, materials, equipment/instrumentation and IT systems. Staff members not directly involved as dry run participants were instructed to minimise cues/prompts intended to ease participant confusion. This enabled the team to observe how participants reacted when faced with obstacles. A video crew was employed to capture dry run execution and generate educational material that doubled as content used to promote staff excitement for activation.

Dry run debriefing and findings management

The debriefing process for dry runs was composed of mini and comprehensive debriefs. All debriefs were facilitated by designated debriefers that were members of the dry run coordination team. The value of having designated debriefers that understand how to elicit discourse from dry run participants is well documented.[6] Mini debriefs were performed immediately after individual dry runs and accomplished a high-level review of execution. Comprehensive debriefs were performed after a cluster of related dry runs and accomplished a detailed review of common workflows and operational readiness. Designated debriefers encouraged dry run participants to engage in reflective thinking. Dry runs yielding excessive findings were subjected to repeated execution.

Debriefers were responsible for documenting findings into a centralised spreadsheet used to collect and organise data from all dry runs. This centralised spreadsheet enabled the coordination team to categorise findings across several key attributes, including priority level. General guidelines were established to ensure consistency in the prioritisation process. High-priority findings had to be resolved prior to activation (eg findings related to patient safety), medium-priority findings should be resolved prior to activation and low-priority findings would be addressed as capacity permitted. Findings were also assigned an accountable individual, responsible party and target resolution date. To further examine the composition of findings, three broad categories were defined: workflows; training and education; and infrastructure, equipment, supplies and technology. These categories were not mutually exclusive.

Following the execution and debriefing of dry runs, daily huddles were instituted to follow up on the resolution of findings in a systematic matter. Facilitated by the coordination team and attended by activation team leadership and dry run participants, daily huddles promoted the timely resolution of findings and fostered frequent communication between stakeholders.

RESULTS

A total of 74 integrated scenarios were simulated, collectively involving 28 vertical and 16 horizontal teams. Individual activation teams also simulated team-specific scenarios intended to validate confined processes. The number and results of team-specific scenarios simulated is not clear because many were pursued on a discretionary basis without oversight from the coordination team. This lack of centralised data collection for team-specific scenarios is a limitation of the study. Altogether, integrated scenario dry runs uncovered 231 findings across 4 waves (Figure 3). Across all findings, 36% were high priority, 42% were medium priority and 22% were low priority.

Of the 231 findings, 77 (33%) were related to workflows, 95 (41%) were related to training and education and 150 (65%) were related to infrastructure, equipment, supplies and technology. Most findings are tied to more than 1 category (Figure 4). Eight findings (3%) were categorised as simulation artefacts, that is, they were deemed a by-product of simulation rather than an actual operational shortcoming. Findings were also broken down by the team responsible for their resolution (Figure 5). Prior to activation, 75% of findings were resolved, 9% were no longer applicable and 16% were prioritised as post-activation projects.

The value of using dry runs as a tool for validation is evidenced by the activation's success. For each of the four outpatient activation waves, executive leadership staffed a command centre that served as the central channel for team leaders and other stakeholders to escalate challenges for awareness and/or resolution. Key performance indicators (KPIs) were defined

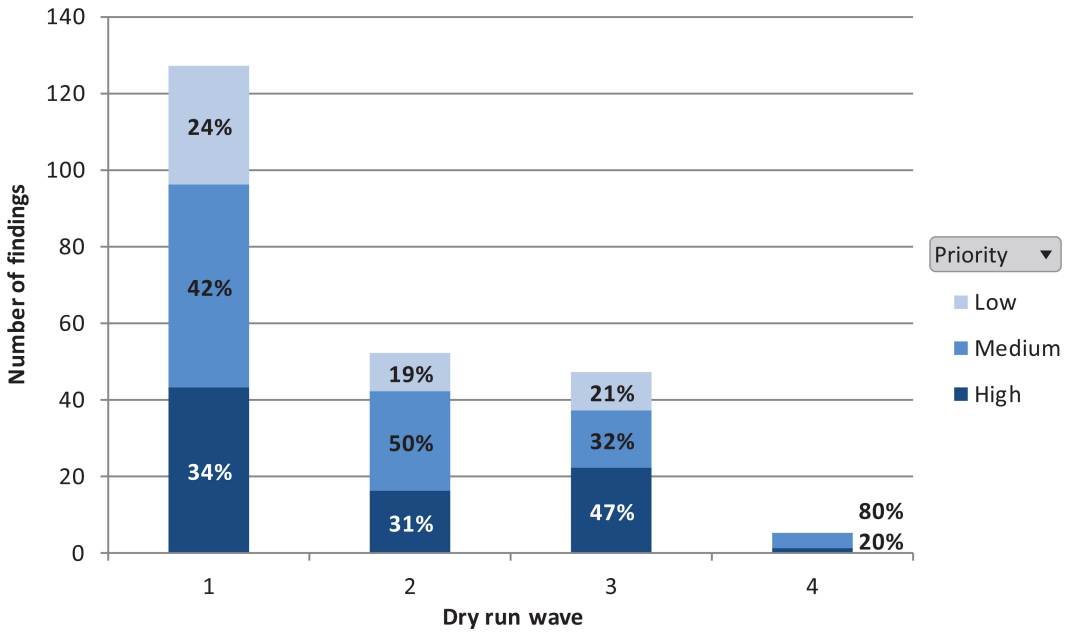

Figure 3: Number of findings by dry run wave. The mass of findings uncovered in the first dry run wave can be attributed to the number of new activation teams involved. While new vertical teams were distributed across each of the four dry run waves, almost all horizontal teams were immediately involved in the first. The relatively few findings uncovered in the fourth dry run wave can be attributed to it having only one new vertical team involved.

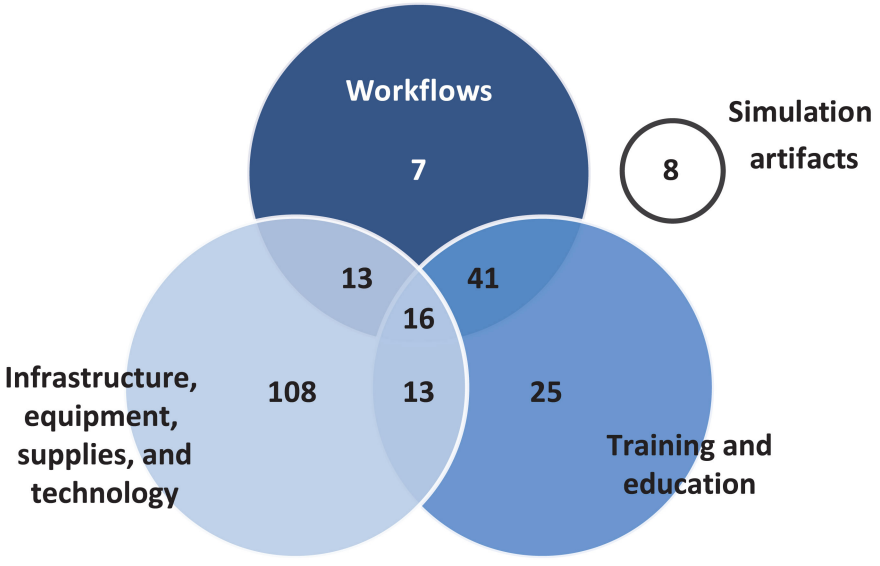

Figure 4: Number of findings by category. Simulation artefacts are findings that were deemed a by-product of simulation rather than an actual operational shortcoming.

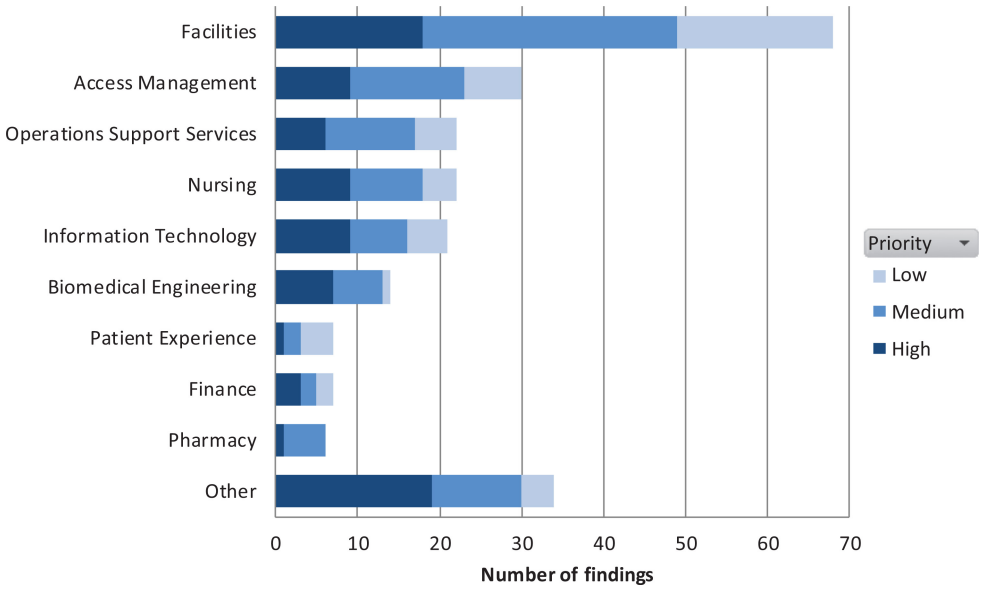

Figure 5: Number of findings by responsible team. All dry run findings were documented in a centralised spreadsheet and assigned, among other attributes, a party responsible for their resolution.

Key Performance Indicator (KPI)	Wave 1	Wave 2	Wave 3	Wave 4
Serious Patient Safety Issues	0	0	0	0
Serious Regulatory or Compliance Issues	0	0	0	0
Major Security Events	0	0	0	0
Challenges Escalated to Command Centre	24	8	2	0
Challenges Resolved	16	5	2	0
Resolution Rate	67%	63%	100%	NA
Command Centre Uptime (days)	3	2	1	NA

Figure 6: Activation command centre key performance indicators. While these waves correspond to the same outpatient specialties assigned to dry run waves in Figure 1, this table examines the results of the activation rather than the results of dry runs. Wave 4 was unique because only one outpatient specialty was activated, and it coincided with the activation of inpatient services, which were supported by the same command centre. Therefore, the Wave 4 command centre uptime was labelled NA since it cannot be wholly attributed to the outpatient activation. NA, not applicable.

and reported to summarise the success of each activation wave. These KPIs tracked serious patient safety, regulatory and compliance issues; majority security events; and general operational challenges (Figure 6). Not only did the command centre receive a much lower-than-expected number of calls during each of the four activation waves, but it also consistently closed earlier than anticipated due to a lack of demand.

In fact, across the activation of all outpatient services, no serious patient safety, regulatory or compliance issues were reported, and no major security events occurred. Instead, calls made to the command centre raised general operational challenges that would commonly be encountered in any activation of this size and complexity. The same methodology used during dry runs of documenting, prioritising, delegating and monitoring the resolution

of findings was replicated by the command centre for the calls it received. Using this approach, the command centre successfully facilitated the resolution of challenges in real time, often on the same day, further contributing to the positive experience of patients and staff.

DISCUSSION

Having all activation teams involved in scenario development and dry run execution enabled a comprehensive assessment of operational readiness. The systematic resolution of findings following the execution of dry runs was directly responsible for the successful activation of outpatient services, which is evidenced by having no serious patient safety, regulatory or compliance issues and no major security events. The rigor with which dry runs were applied and followed up on in preparation for activation required significant time and resources. That said, it may be impractical for some organisations to reproduce the methodology as described.

While in situ simulations are regularly used to uncover latent gaps, the success with which such gaps are resolved is not always discussed. A different approach to assessing the value of conducting simulations that is commonly found in the literature is administering surveys. These surveys often gather quantitative data from dry run participants about what impact the simulations had on their feeling of confidence and preparedness.[7] While the methodology used at SSMC did not expressly call for the collection of this type of data, anecdotal evidence suggests that participants also found dry runs to have a positive impact on such feelings.

As shown in Figure 4, most findings were either fully or partially categorised under infrastructure, equipment, supplies and technology. This was interesting because, as discussed in the methodology, prerequisites for dry run execution stipulated that facility construction had to be completed; materials stocked; and equipment/instrumentation procured, installed and validated. While some may interpret this as evidence that prerequisites were not adequately fulfilled, it was instead concluded that the prevalence of this type of latent gap could be attributed to the limited exposure that staff had to the new facility prior to conducting dry runs. In fact, the make-up of findings reported in a similar paper also had a large percentage that could be categorised under infrastructure, equipment, supplies and technology.[8]

Despite the team's success, the methodology did have limitations. While collocated dry runs were largely conducted at the same time by design, developing scenarios that involved multiple patient actors would be a more direct way to stress systems susceptible to high volumes. Such systems include registration queue management and room occupancy management. When examining the substance of calls made to the command centre during each activation wave, many of the reported challenges could have been exposed during dry runs if more high-volume simulations were conducted. Another limitation of the methodology was the advance knowledge of scenario scripts held by emergency teams when responding to simulated codes. Realism was impacted because emergency teams already knew what would happen and the general location in which it would happen. This is consistent with the limitations reported in the literature examining simulated emergency scenarios in a new facility.[9]

References

1. Adler, M., Mobley, B., Eppich, W., Lappe, M., Green, M., Mangold, K. (2018) 'Use of simulation to test systems and prepare staff for a new hospital transition', *Journal of Patient Safety*, Vol. 14, pp. 143–147.
2. Ventre, K., Barry, J., Davis, D., Baiamonte, V., Wentworth, A., Pietras, M., Coughlin, L., Barley, G. (2014) 'Using in situ simulation to evaluate operational readiness of a children's hospital-based obstetrics unit', *Sim Healthcare*, Vol. 9, pp. 102–111.

3. Aguilera, L., Dickey, E., Guzman, K. (2019) 'Using interdisciplinary dress rehearsal events to ensure staff readiness when opening a new healthcare facility', *HERD*, Vol. 13, pp. 221–233.
4. Mannenbach, M., Fahje, C., Sunga, K., Sztajnkrycer, M. (2019) 'An in situ simulation-based training approach to active shooter response in the emergency department', *Disaster Medicine and Public Health Preparedness*, Vol. 13, pp. 345–352.
5. Garrett, B., MacPhee, M., Jackson, C. (2010) 'High-fidelity patient simulation: Considerations for effective learning', *Nursing Education Perspectives*, Vol. 31, pp. 309–313.
6. Ryoo, E., Ha, E. (2015) 'The importance of debriefing in simulation-based learning: Comparison between debriefing and no debriefing', *Computers, Informatics, Nursing*, Vol. 33, pp. 538–545.
7. Francoeur, C., Shea, S., Ruddy, M., Fontela, P., Bhanji, F., Razack, S., Gottesman, R., Genova, T. (2017) 'It takes a village to move a hospital: Simulation improves intensive care team preparedness for a move to a new site', *Hospital Pediatrics*, Vol. 8, pp. 148–156.
8. *Adler*, ref. 1 above.
9. Villamaria, F., Pliego, J., Wehbe-Janek, H., Coker, N., Rajab, M., Sibbitt, S., Ogden, P., Musick, K., Browning, J., Hays-Grudo, J. (2008) 'Using simulation to orient code blue teams to a new hospital facility', *Sim Healthcare*, Vol. 3, pp. 209–216.