Case Study 12: HOSPITAL AT HOME

Recovery in the comfort of the patient's home

JHAH's five-year Clinical Services Plan
Transformation Project #3Av

Project Champion
Dr. Kanaan Kanaani

Clinical Services Plan

مركز جونز هوبكنز
أرامكو الطبي
**Johns Hopkins
Aramco Healthcare**

Case Study 12: HOSPITAL AT HOME

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Project Details

The Objective

- To provide a Virtual Ward service for patients at home with facilitated discharge for those that need a short period of hospital-level care.

The Priorities

- Define the scope of service.
- Create protocols for governance of clinical, operational and technology matters.
- Launch the service and provide ongoing oversight during the ramp-up period.

The Timeline

- **Project kick-off:** November 2023
- **Project closure:** Planned for Q1 2025

The Project Team

Sponsor:

- Dr. JJ de Gorter, Chief of Staff

Champion:

- Dr. Kanaan Kanaani

Team members:

- Rami Abdullah
- Fahad AlHarthi
- Mohammed Almatooq
- Jamil Ammar
- Daliah Basrawi
- Daniel Bregaglio
- Asim Chaudhri
- Shantelle Cupido
- Kawthar Hussain
- Yussra Ibrahim
- Nada Khalifa
- Dr. Mahmadu Maida
- Maha Makled
- Nefishetu Momodu
- Kasturi Ramasamy
- Ahmad Qatrameez
- Ramez Yusssuf

For more information

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About the Clinical Services Plan

Johns Hopkins Aramco Healthcare (JHAH) serves more than 140,000 Aramco employees, their relatives and retirees with a comprehensive range of inpatient and outpatient services. JHAH has carried forward the legacy set by Saudi Aramco of healthcare for all, putting caring for its community at the heart of everything it does.

In 2023, JHAH launched its five-year Clinical Services Plan (CSP). The CSP was developed in response to changing patient expectations and the realization that JHAH must evolve if it is to survive and thrive. The Plan's vision is that JHAH will become the Kingdom's first choice for outstanding integrated healthcare.

The CSP contains 16 strategic objectives to deliver against five goals (service excellence, access, people, sustainability and reliability), and is supported by four delivery principles (accountability, pace, pragmatism and outcomes).

The 'Hospital at Home' (HaH) project was included as Objective #3Av in the CSP.

Project Background

There is an increasing body of evidence, based on randomized controlled trials, to suggest that Hospital at Home care for post-operative patients, involving remote automated monitoring technology and regular physician visits, can have significant benefits. One of the most comprehensive recent studies was led by Michael McGillion, associate professor and assistant dean of research at McMaster University's Faculty of Health Sciences in Canada. In a 2021 paper published in the British Medical Journal, McGillion set out to determine the impact of virtual care involving 905 patients aged 40 years and above who had been treated at eight acute care centers. His conclusion was that "Virtual care with Remote Access Monitoring) RAM shows promise in improving outcomes important to patients and to optimal health system function." [1]

Additional studies have been published which drill down into the benefits (and potential risks) of so-called 'hospital at home' programs in terms of safety, effectiveness reduced iatrogenic complications and cost savings. Ten of these reviews were collated by Leong et al, also in 2021, to highlight the types of patients most likely to benefit from home-based recovery, the impact of a positive patient experience in a familiar setting removed from the risk of hospital acquired infection, and the 'process components' that increase the success of hospital at home implementation[2]. Based on their analysis, the authors concluded that:

"HaH is largely safe and effective for suitable patients requiring hospital-level care. HaH generally leads to similar or improved clinical outcomes, shorter hospital length of stay (LOS) and high patient satisfaction when compared with inpatient care. HaH particularly warrants greater attention in health systems that are challenged by capacity constraints and rising costs."

For JHAH, the HaH concept offered many potential advantages. Most importantly, it could benefit the patient him- or herself, if they were able to recover safely and more quickly than if they remained in the hospital environment. For patients waiting for an operation, it could bring forward the date of their admission through freeing up bed capacity. And, since JHAH had recently launched a teleconsultation service (white labelling the services of TruDoc, a specialist service provider), which is extended to hospital at home patients ,allowing them 24/7 access to a physician.

The JHAH team ensured that strong governance protocols were in force. All physicians that would have contact with patients went through the rigorous Credentials and Privileging process before being approved as being of the required standard. These physicians were based onsite at the Dharan hospital in order to ensure that they were able to work seamlessly with JHAH's Case Management and Hospitalist teams. A governance taskforce was set up to monitor the quality of the end-to-end service, as well as the medical outcomes. Initially, this team met daily to review the status of each patient within the service; over time, these reviews have moved to twice weekly.

Project Delivery

A project team was mobilized in late 2023, with a stretch target to launch the service within a five-month period, structured as a 12-month pilot. The team was chaired by Dr. Kanaan Kanaani, one of JHAH's most experienced and technology-literate physicians who had recently led the launch of a 24/7 out-of-hours teleconsultation service for eligible medical recipients. The project team comprised representatives from all stakeholder departments and functions – including clinical quality, risk management, hospitalist services, nursing, finance, human resources, information technology and supply chain. The team was led by Asim Chaudhri, an expert in healthcare technology from the Middle East-based consultancy firm Greybeard Healthcare.

The first task was to agree the key principles of how the service would be run. After considering a number of options, and drawing on experience from benchmark services outside the Kingdom, the following principles were agreed:

- JHAH's HaH program would be a physician-led service (hence differentiating it from services such as home healthcare).

- It would be available to patients considered stable by their physician, and who had been assessed against clear criteria, with the patient fully involved in the consideration and making the final decision.

- The care would be of hospital-level quality with continuity of care throughout the period of transfer and until final discharge from HaH.

- A documented, individualized care plan would be created for each patient, with protocols for accessing physicians, nurses, physiotherapists, dieticians, as required.

- Prescriptions would be supplied at home, as well as – wherever possible – diagnostics including lab tests.

- 24/7 Remote monitoring would be undertaken at a command center open 24/7, with rapid response protocols whenever any readings deviate from expectation, and with a physician available to visit within a maximum waiting period of 30 minutes.

Figure One summarizes some of the essential differences between a HaH service, and a home healthcare service:

Figure One: Hospital at home versus home healthcare

	Hospital at home	Home healthcare
Purpose	Facilitation of discharge and admission divergence	Avoidance of admission
Service provision	• Patients are transferred out of hospital • Remote 24/7 monitoring of patient • 24/7 call centre for advice and support • Home visitation and rounds • Face-to-face care by physicians, nurses, physical therapists • Medication administration, wound care, blood collection, etc.	• Patients kept away from hospital • Provision of nurse for patients confined to the home for acute care • Supported by physician • Medication administration, wound care, blood collection, etc.
Target patients	• Stable low- or high-risk patients with high readmission rate • Acute or subacute stabilized patients to reduce their length of stay • LTC patients for specific care needs that require hospital-care level for limited period	• Long-term care (LTC) patients • Intermittent care needs • Patients in need of intermittent care but do not require hospital stay
Care delivery	• Multidisciplinary care (physician-led) • Home visitations as part of short term management plan	• Nursing-level care with multi-disciplinary team support • Home visitations for specific needs • Long-term care
Resources & Technology	• Tele-monitoring capabilities and devices • 24/7 teleconsultations support	• Hands-on instrumentations • Provider's applied medical devices

As a new service launch, it was particularly important to ensure all the essential components of a robust and high-quality clinical operating model were considered, documented and in place prior to the first patient being admitted to the program. Dr. Kanaan oversaw the development of an integrated launch plan, which placed particular focus on clinical, operational and technology governance. One of the key decisions was to be clear on the categories of patients for which the service would, and would not, be appropriate. In total, 12 'Conditions Precedent' were identified; these were the issues that needed to be comprehensively addressed before Dr. Kanaan would be prepared to recommend to the Chief Of Staff that the service was ready to launch. These Conditions Precedent are itemized in Figure Two.

Each of the above Conditions was linked to a series of tasks, and the 'fully met' status was only confirmed once each of these tasks had been completed to the satisfaction of the project team leadership. For example, the 'Clinical Governance' tasks were:

• Map detailed processes.
• Develop and agree a governance model
• Document and approve required policies
• Develop and agree KPIs and measures.

Similarly, the 'Technology' tasks were:

• Identify application requirements
• Set up and build applications
• Review connectivity requirements
• Design and implement connectivity solution.

The service was launched on 23 April 2024, and was allowed to grow slowly. During the first month, an average of five patients were in the virtual ward on any given date; within six months, this had risen to an average of eighteen.

Figure Two: HaH service launch Conditions Precedent

Condition	Status 90 days prior to launch	Status at launch
Clinical governance	Largely met	Fully met
Communications (within JHAH)	Underway	Fully met
Communication materials (potential patients and their families)	Underway	Fully met
Licensing	Underway	Fully met
Workflows	Fully met	Fully met
Workforce recruited	Fully met	Fully met
Workforce: credentialling and privileging	Underway	Fully met
Workforce: training	Not yet commenced	Fully met
Workforce: location within hospital	Largely met	Fully met
Risk management plan	Largely met	Fully met
Technology connectivity	Largely met	Fully met
Technology applications	Underway	Fully met

Figure Three: Patient numbers in the HaH program
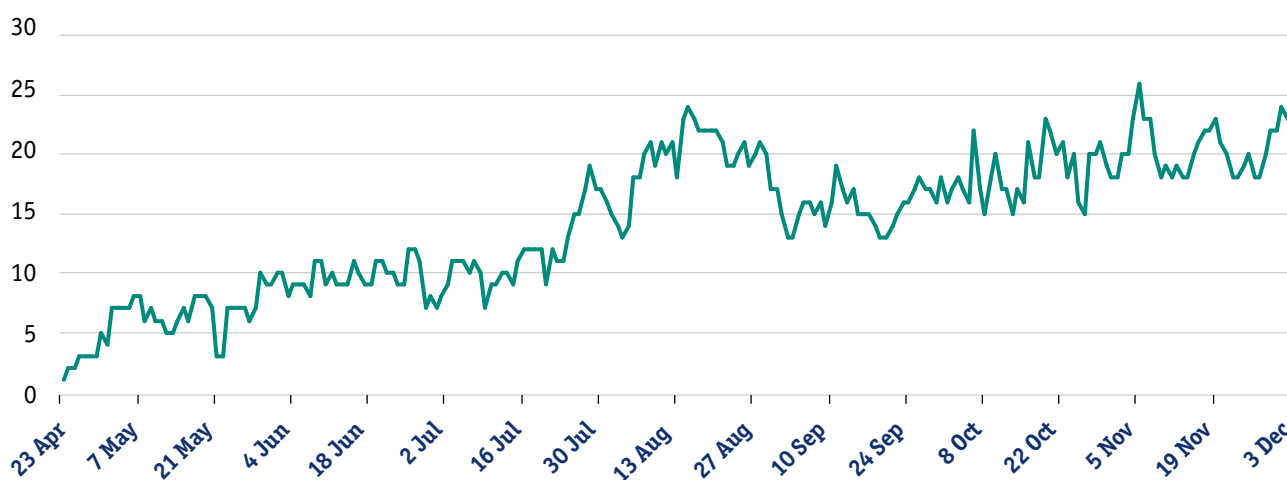
The very first patient was a gentleman who had been admitted for treatment of a urine tract infection. Due to the complexity of his health problems, he required more individualized attention and tailored treatment plans, which can lead to better outcomes. The HaH was a perfect fit since it allowed the physicians to monitor him regularly and adjust treatment plans as necessary, leading to effective management of symptoms and recovery. The importance of family participation as part of the care plan at home was evident in this case, as in other cases. It was found to enrich the patient's support system and improve compliance with the prescribed treatment plan.

There are a number of conditions that have proven to be particularly appropriate for treatment within a HaH setting and we started with these, including:

- COPD/Asthma
- Cellulitis
- Congestive heart failure
- Community acquired pneumonia
- Sickle cell disease
- UTI/Pyelonephritis
- Venous thrombo-embolism
- Following diabetic ketoacidosis.

However, over time the project team realized that other diagnoses were also relevant for the patient and these were included as the project progressed. It also noted the need for this service to add further value by providing physiotherapy to ensure that patients were in a better state of readiness after completion of their treatment on the ward.

The project team was responsible for regular monitoring and reporting of the key KPIs, including bed days saved, patient satisfaction and average length of stay.

Later in 2024, JHAH embarked on a month-long initiative ('Super October') to increase the number of surgeries within the hospital. The HaH service supported this initiative by accepting post-operative transfers.

Project Benefits

In November, the Chief Of Staff requested a detailed post-launch assessment. To ensure this report was based upon the latest, most accurate information, representatives from the JHAH project team traveled to Dubai for a two-day workshop with TruDoc executives, during which every statistic was interrogated and, where possible, benchmarked against global practice.

Once complete, the report quantified the impact of the service over a seven-month period across multiple dimensions, including the number of patients who had been admitted to the HaH program, the average length of stay within HaH, the readmission rate, the patient satisfaction rate, and the bed days saved. In addition, the financial impact of the service was also quantified. The calculation was based on differential between the cost of bed days at the hospital and providing the service at home. The key benefits are highlighted in Figure Five.

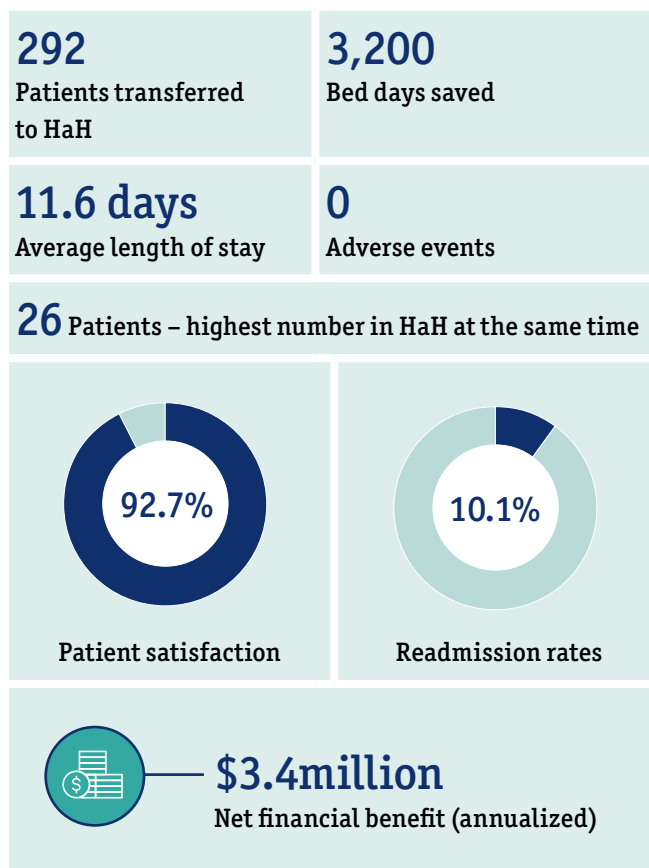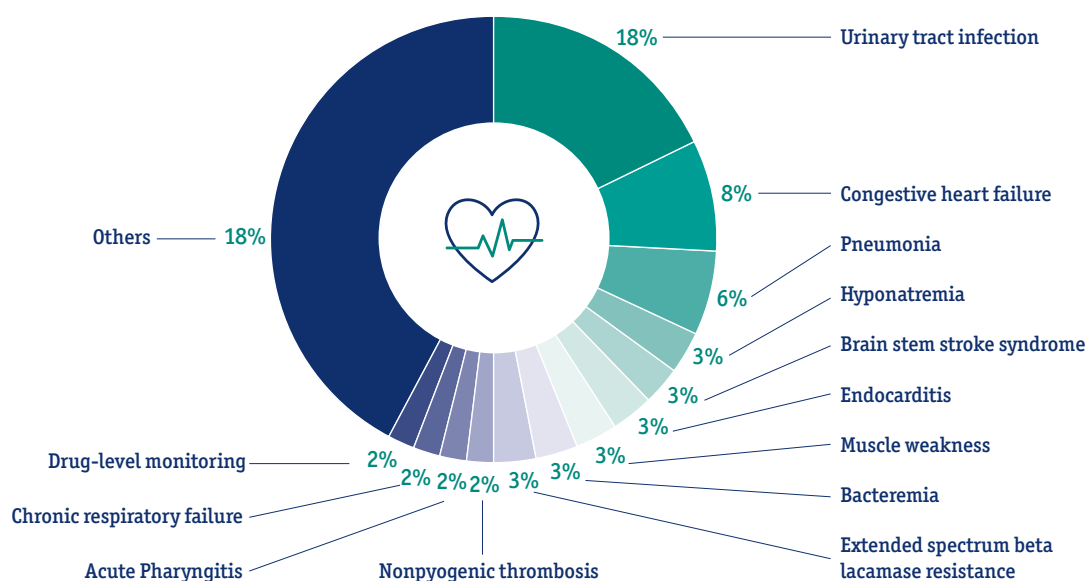## Figure Five: HaH benefits (first seven months)

292 Patients transferred to HaH	**3,200** Bed days saved
11.6 days Average length of stay	**0** Adverse events

26 Patients – highest number in HaH at the same time

92.7% Patient satisfaction

10.1% Readmission rates

$3.4million Net financial benefit (annualized)

Figure Four: HaH patient mix

- 18% — Urinary tract infection
- 8% — Congestive heart failure
- 6% — Pneumonia
- 3% — Hyponatremia
- 3% — Brain stem stroke syndrome
- 3% — Endocarditis
- 3% — Muscle weakness
- 3% — Bacteremia
- 3% — Extended spectrum beta lacamase resistance
- 2% — Nonpyogenic thrombosis
- 2% — Acute Pharyngitis
- 2% — Chronic respiratory failure
- 2% — Drug-level monitoring
- 18% — Others

Benchmarking was not available for all these factors, but – where it was – it seemed to reinforce that the service was operating within acceptable parameters. For example, the readmission rate, at 10.1%, was within the anecdotal range of 5% to 15% experienced at comparable services. An excessive readmission rate could have been an indicator that inappropriate patients were being admitted to the program.

Other benefits had been experienced but were more difficult to quantity, including:

- Reduced pressure on hospital car parking
- Reduced risk of acquiring hospital infections
- Reduced levels of anxiety among post-operative patients.

The workshop also looked ahead, at how the HaH capability could be extended to a broader range of patient circumstances. Some of these expansions options are shown in Figure Six.

As JHAH modernizes and innovates, there are a number of other strategies being explored that will benefit from this newfound capability to deliver high-quality hospital-level care within the home. This includes the expansion of services such as:

- Pediatric care
- Integration with Home Hemodialysis
- Home chemotherapy
- Palliative care.

In addition, 'Population Health Management' approaches will be a rapidly increasing priority in 2025 and beyond, as JHAH invests in screening, prevention and the effective long-term management of chronic conditions. HaH will have an essential role to play in the success of this vision.

Lessons Learned

With the benefit of seven months' post-launch perspective, Dr. Kanaan reflected on the decisions the team had made while designing the service – including those judgments that had been validated by subsequent experience, as well as others which might have been handled differently.

- HaH physicians onsite. One of the early design decisions had been to make available a dedicated office with the hospital for use by the HaH physicians. "This proved to be critical," said Dr. Kanaan. "It meant they maintained a high profile with the hospitalist staff, and were able to discuss potentially suitable candidates for admission to the virtual ward on a daily basis. Over the weeks and months, you could see confidence and respect was strengthening on both sides." The patient onboarding process is detailed in Figure Seven.

- Technology integration. "The flow of information between systems had to be flawless, for reasons of both patient safety and speed of decision making," observed Dr. Kanaan. "For this reason, colleagues from JHAH's Information Technology department were absolutely indispensable members of the project team. They undertook vendor technology due diligence prior to selection, tested the robustness of all technologies, and ensured the technology architecture satisfied all relevant cyber security and patient confidentiality requirements."

- Starting small and then expanding. At launch, the definition of those patients who might benefit from entering into the HaH program was drawn tightly. Over time, as the benefits have been proven, the definition has been expanded. "It was important to sequence the rollout in this way," explained Dr. Kanaan. "We wanted to prove, at every step of the way, that patients would benefit from the opportunity, and only continue on the journey once this had been demonstrated."

Figure Six: HaH expansion options

'Same-day discharge' patients from OR

Patients with chronic medical conditions

Patients needing intensive physical therapy or respiratory rehabilitation

Transfers from the Emergency Department

Extension beyond Dhahran (eg. Qatif)

With the benefit of hindsight, there are a couple of aspects of the project plan that could have been handled differently. Dr. Kanaan explains: "As a new concept, we probably should have spent more time working on how the service would be explained to all the many groups of people who would be affected. Not just the patient, but also the patient's family, and of course the physicians at JHAH who would be asked to make the transfer assessment. I think that, since we had all been working intensely on the project, we assumed everyone else would have an equivalent level of knowledge."
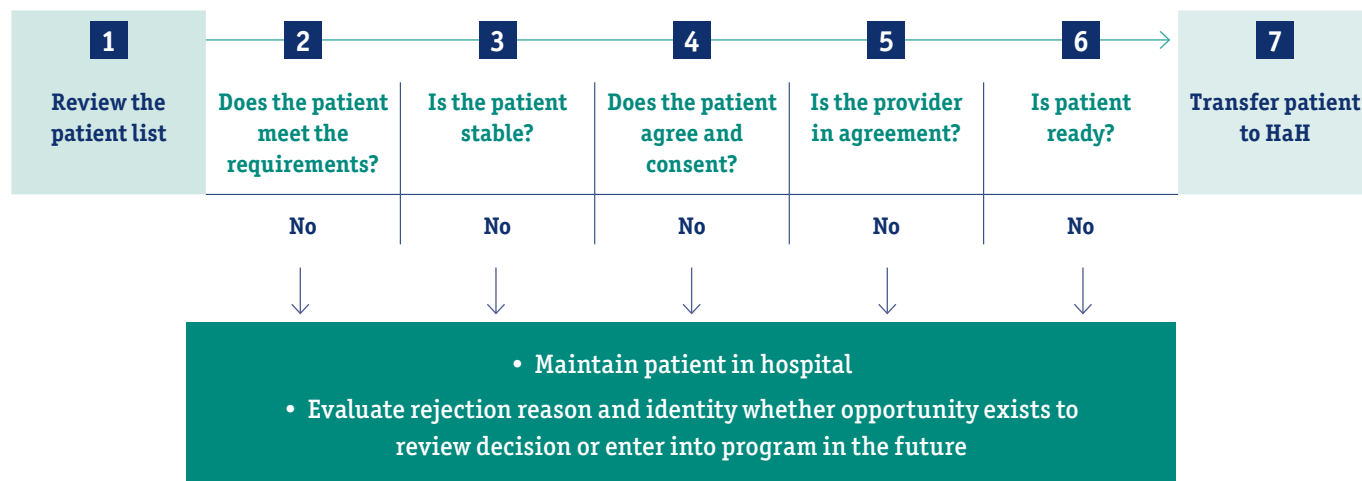
Dr. Kanaan also highlights an area where the reality of the service delivery experience has departed most dramatically from the pre-launch expectation. "Our assumption had been that the typical patient would stay in the virtual ward for three or four days, and then be ready for discharge. In other words, it was mostly suitable for patients already on the verge of discharge, but who were not quite ready. In fact, the average length of stay in the HaH program has been around 11 or 12 days – three times higher than expectation. This hasn't affected the business case – every one of those days frees up bed capacity. Nevertheless, it's interesting that the program seems to have a significantly wider applicability than we forecast."

Looking ahead, Dr. Kanaan foresees the HaH service becoming ever more closely integrated into frontline hospital services. This will be driven by:

- Data on LOS. For example, there has already been a "dramatic decrease" in recent decades in hospital length of stays following a radical prostatectomy procedure[3], and this experience is also now being witnessed in other specialties.

- New technologies, enabling effective monitoring of more conditions on remote basis.

- Patient demand, driven by positive word-of-mouth about the benefits of recuperation at home.

"Intuitively, it has always seemed to be common sense that people will recover better in a familiar setting, surrounded by their family, and without hundreds of other ill people in the same building," says Dr. Kanaan. "Finally, having seen first-hand the success of our HaH operation, and having spoken to almost every one of our patients who have experienced it, JHAH has enough evidence of its efficacy to move beyond the pilot phase, and include the Hospital at Home option as a central feature in our more important discharge pathways."

Figure Seven: Patient onboarding process

1	2	3	4	5	6	7
Review the patient list	Does the patient meet the requirements?	Is the patient stable?	Does the patient agree and consent?	Is the provider in agreement?	Is patient ready?	Transfer patient to HaH
	No	No	No	No	No	

- Maintain patient in hospital
- Evaluate rejection reason and identity whether opportunity exists to review decision or enter into program in the future

Notes

1. McGillion et al, 'Post-discharge after surgery Virtual Care with Remote Automated Monitoring-1 (PVC-RAM-1) technology versus standard care: randomised controlled trial', British Medical Journal, 30 September 2021 (citation: BMJ, 2021;374:n220).

2. Leong et al, 'Comparison of Hospital-at-Home models: a systematic review of reviews', BMJ Open, January 2021.

3. Nelson et al, 'Comparison of length of hospital stay between radical retropubic prostatectomy and robotic assisted laparoscopic prostatectomy', Journal of Urology, March 2007.

About the Project Champion

Dr. Kanaan Kanaani

Dr. Kanaani is a Family Medicine Consultant at Johns Hopkins Aramco Healthcare, where he has previously chaired the Primary Care Service Department.

He was educated at King Faisal University, Dammam, Saudi Arabia (Bachelor of Medicine and Bachelor of Surgery), the University of Toronto, and the American College of Healthcare Executives (Executive Leadership Certification).

Before joining JHAH, he was a Family Medicine Specialist at Saudi Aramco Medical Services Organization (SAMSO), and served as the Head of the SAMSO Learning and Development division.

He is a recognized board examiner at the Saudi Commission for Health Specialties (SCFHS) and holds a Clinical Teaching Certificate from the University of Toronto.

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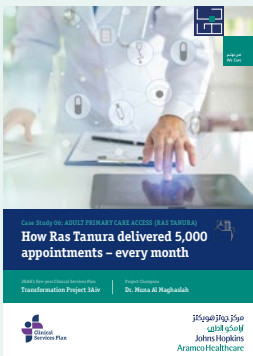**Enhancing access to JHAH for non-registered Saudi Aramco EMRs**

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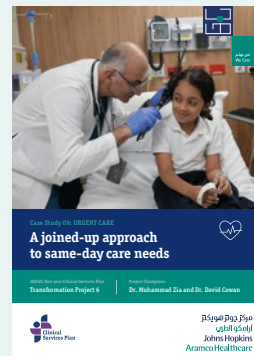**ADULT PRIMARY CARE ACCESS (DHAHRAN)**

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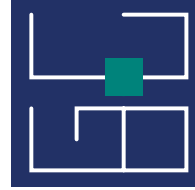**Applying the WISN model to optimize workforce planning**

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