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The
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**CASE STUDY:
TRANSLATING A LOW-COST, HIGH-QUALITY MULTISPECIALTY HOSPITAL
MODEL TO NEW ENVIRONMENTS: THE CASE OF NARAYANA HEALTH AND
HEALTH CITY CAYMAN ISLANDS**

Andrea Taylor, Innovations in Healthcare, Duke University
Erin Escobar, Innovations in Healthcare, Duke University
Krishna Udayakumar, Innovations in Healthcare, Duke University

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Abstract: Narayana Health (NH), one of the largest chains of multispecialty hospitals in India, was founded in Bangalore to provide high-quality affordable cardiac care. It combines innovative technology and a highly efficient delivery system, boasting quality outcomes that rival the United States and the United Kingdom at a fraction of the cost. Through a joint venture with Ascension Health, NH recently established Health City Cayman Islands (HCCI), a 101-bed tertiary-care hospital on Grand Cayman. By incorporating NH's efficiencies, HCCI is designed to dramatically increase access to high-quality, affordable specialty care to residents of the Americas and the Caribbean facing a scarcity of tertiary care, as well as to medical tourists facing prohibitive costs in their own countries, including the United States. The experience of implementing HCCI, documented in this case study, highlights the challenges in wholesale replication of health care innovations from abroad. At the same time, our findings point to components that U.S. health care leaders might consider adopting.

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BACKGROUND

Health systems worldwide are searching for innovative health care models that lower costs, improve quality, and increase access to services. Narayana Health (NH) is one of the best-known examples globally. Formerly known as Narayana Hrudayalaya Hospitals, NH was founded by Devi Prasad Shetty, M.D., in 2001 in Bangalore, India, to provide high-quality, affordable cardiac care to everyone, regardless of ability to pay.

Evolving lifestyle and diet in India have caused an unprecedented increase in heart disease. Around the time of NH's founding, approximately 2.4 million people in India required heart surgery annually, but prohibitive costs meant only 60,000 surgeries were performed each year.ⁱ

This gap was the catalyst that inspired Dr. Shetty to create NH, now one of India's largest multispecialty hospital chains, providing tertiary care in nearly all specialties. By combining innovative technology and a highly efficient delivery system, NH is able to optimize productivity and minimize costs.

WHAT IS THE INNOVATION AND HOW DOES IT WORK?

The success of the NH model is achieved through multiple complementary mechanisms.

These include:

- leveraging economies of scale;
- using assembly line concepts for surgery;
- having an extreme focus on efficiency;
- reducing the average length of stay for the benefit of both patients and the hospital; and
- reengineering both design and materials to reduce the cost of ownership across equipment life cycles.

Because of these innovations, the average cost of open-heart surgery, as reported by NH, is \$2,000. The same procedure at a U.S. research hospital typically costs more than \$100,000.ⁱⁱ

Utilizing a pay-per-use model with suppliers for some diagnostic equipment, NH is able to minimize capital costs and thus expand very quickly.ⁱⁱⁱ Strict sterilization procedures at NH, permitted by the Joint Commission International (JCI), allow reuse of devices, such as guide wires and some catheters in cardiology, that are typically disposed of after a single use. A centralized cloud environment connects all NH hospitals and hosts critical hospital applications, enabling central monitoring of transactions across locations. Centralized purchasing allows NH

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to take advantage of economies of scale. Bar coding of stock enables precise inventory counts at any time, minimizing holding costs and releasing blocked working capital.

In addition to services at its own facilities, NH has one of the world's largest telemedicine networks, connecting 800 centers globally. It has treated over 53,000 patients through telemedicine programs. NH uses mobile outreach vans to further increase access to diagnostic and consultation services in semi-urban and rural areas of India.

Using a shift system for surgery and task shifting among staff create an exponentially more efficient operating theater, resulting in more procedures completed per day. Surgeons perform only the tasks they are uniquely qualified to do, and less-skilled staff members perform other tasks, such as preoperative preparation, patient education, and charting. Each staff member practices at the top of his or her scope of practice. This allows quick patient "throughput," because the surgeon need only turn around to begin the next surgery on a fully prepped patient. This high volume drives lower costs and better quality outcomes; surgeons gain tremendous experience in a short time, helping NH clinicians to excel in their domain.

The powerful brand, social mission, and leadership of NH, as well as competitive compensation and incentives, attract and retain highly qualified cardiac surgeons and other tertiary care specialists from around the world. NH has approximately 16,000 employees, with 11,000 clinicians spread across the company, including HCCI (see appendix), and 4,000 people are subcontracted for housekeeping and security.

Data use also drives cost reduction and efficiency across NH. Profit and loss statements are updated daily and sent via email or text message to executives, allowing NH to identify and address capital flow issues as they arise, rather than weeks later. Performance of individuals and departments is monitored daily. NH designed a customer-centered complaints process in 2011 that provides a simple and powerful tool for monitoring and ongoing improvement.

NH is a profitable organization. Eighty percent of its total revenue is generated from inpatient visits, 10 percent from outpatient visits, and 10 percent from remote consultations and diagnoses.

NH hospitals serve anyone who needs care, regardless of ability to pay. More than 50 percent of patients receive subsidized inpatient care annually, with an average discount of 15 percent. This is accomplished through a cross-subsidy model, in which wealthier patients pay more for nonclinical amenities, such as private recovery rooms. The subsidization scheme is sustainable because the full charge is still far below the cost of comparable services at other private hospitals, making NH an attractive option for paying patients. Free care is also supported through philanthropy.

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IMPLEMENTATION AND SCALE

NH's scaling strategy is multidimensional: growing its depth as large patient volumes drive increased hospital bed capacity, while expanding in breadth as the number of specialties provided increases, with additional growth across sectors (developing medical education programs) and locations. Since its founding in Bangalore in 2001, NH has grown its network to 31 hospitals across 19 cities.

The recent adaptation of the Narayana model from India to the Caribbean illustrates how ecosystems impact implementation and sustainability, in both positive and negative ways (see appendix for discussion of the HCCI business model).

NH considered many locations for a potential replication; the choice of Grand Cayman was driven by a serendipitous convergence of factors, including enthusiasm of local business leadership, the Caymanian government's identified need to diversify its economy in the wake of the recent global recession, and NH's strategic desire to establish a presence in the region (Box 1). The island's well-developed tourism industry, strong infrastructure, low crime, and geographic proximity to the target market made it an attractive environment.

The Caymanian government's willingness to make sweeping changes to the regulatory and policy environment to accommodate HCCI was the critical factor in the decision. The government changed nine laws and 13 regulations in 2.5 years, including its health practice law,

Box 1. Key Partners in the HCCI Replication

Caymanian businessmen Harry Chandi and Gene Thompson were critical in the genesis of HCCI. Chandi, a Cayman resident of Indian origin, became a good friend of Dr. Shetty after the doctor treated Chandi's father. Thompson was Chandi's business partner and a third-generation Caymanian director of Thompson Development Ltd., a premier development company in the Cayman Islands. The government had approached Thompson about developing avenues for economic diversification. Chandi and Thompson, inspired by Dr. Shetty's vision, were vital in brokering relationships between NH and the Cayman government and developing the project's master plan. "Ignorance is empowerment," said Thompson. "We knew no boundaries, limits, barriers; we only saw opportunities."

At the same time, Ascension Health, the largest faith-based and largest not-for-profit health system in the United States, was likewise motivated by NH's mission-driven approach. In Bangalore, NH had collaborated with TriMedx (a subsidiary of Ascension) to service equipment beyond its usual lifespan, resulting in reduced capital expense and operating costs. The executive leadership team at Ascension saw the investment in HCCI as an opportunity to provide affordable health care, particularly to vulnerable populations, as well as to test innovative ways to increase quality while decreasing costs that could apply in the United States.

which now recognizes Indian medical qualifications and approves Indian doctors and nurses to practice in the Caymans. Tort reform capped medical malpractice payouts at \$620,000, thereby reducing insurance costs for the hospital.^{iv} Immigration law was changed to support visa concessions for countries that are passport-bound,

allowing patients to freely travel to Grand Cayman for care, and duty tax was waived for imported medical supplies. The government also preapproved expansion to match the project's 15-year master plan timeline (see appendix).

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Efficient construction methods (e.g., insulated concrete forms that decrease air conditioning use by 40 percent) sped up construction of the HCCI hospital, resulting in completion within budget within 12 months (Box 2).

In its early stage, key factors threatened to hinder the model, including the work culture, volumes relative to scale and supply chain advantages, and administrative inefficiencies. As HCCI grows, it may be difficult to continue importing medical teams, so the administration is working to embed the NH work culture locally. However, the work culture itself will need to adjust to

cultural norms in the Cayman Islands.

Box 2. Efficiency in Construction: Completed Early at \$420,000 per Bed

Hospital construction integrated many concepts and lessons from India, including Dr. Shetty's philosophy of incorporating natural light into all areas of the building, especially operating rooms. There was a firm commitment to lean and green hospital design. A number of operational customizations, such as on-site oxygen manufacturing, use of solar power, and recycling of outflows for non-potable uses, will allow for long-term cost-savings and mitigate environmental concerns. "The sum total of multiple efficiencies in the construction process had greater impact than one silver bullet of saving," notes Gene Thompson.

The hospital was built at \$420,000 per bed, compared to an average of \$1 million per bed in the United States. Minimalistic yet utilitarian, HCCI has just over 100,000 square feet, less than half the size of a typical Western hospital. This created construction and operational savings.

Regionally, there are disparate health care markets. Every island in the Caribbean has its own market drivers. HCCI must study this to successfully grow patient volume. Higher operational costs and the supply chain

logistics of an island, along with territorial issues for local companies, are other early stage ecosystem challenges.

In the short to medium term, HCCI is targeting Caymanians and other Latin American and Caribbean residents covered by government or private insurance, as well as wealthy patients who pay out of pocket (Box 3). Through a partnership with the Heart to Heart organization, HCCI

Box 3. Targeting Multiple Markets

Employer-based insurance is required by Cayman law, with the remainder of citizens covered by government plans, resulting in nearly universal insurance coverage and very low out-of-pocket expenditures. HCCI reports that for its Caymanian patients, 95 percent of health spending to date is through insurance, with only 5 percent out of pocket, an anomaly in the Caribbean. The islands' educated, savvy patients often go overseas (typically Miami) for specialty care because local services have been scarce or unavailable.

HCCI has already engaged the key insurance providers in the Cayman Islands. However, the Cayman Islands has only 55,000 citizens, not sufficient volume to drive the efficiencies that are the hallmark of the NH model. Therefore, the HCCI marketing team is aggressively analyzing gaps in the Caribbean market. It is working with insurance companies, self-insured companies (more incentivized than traditional insurers by deep cost cuts), and cruise lines. The main targets for near-term growth are Jamaica, Turks and Caicos, the Bahamas, Trinidad, St. Marteen, and the Dominican Republic.

Recent JCI accreditation (received in April 2015, making it one of the youngest hospitals to receive the international gold standard certification) gives the hospital significant credibility and positions HCCI to ramp up marketing both regionally and in international markets. HCCI's medium-term strategy will target patients from the United States and Canada, with longer-term prospects from South America and Europe. In Canada, for example, they plan to target people for whom the opportunity cost of wait times for surgery outweighs the price of paying out of

also provides subsidized cardiac surgery for Haitian children. Traditional insurance companies in the United States are not the immediate way forward for growing volume, though self-insured companies may be willing to partner with HCCI.

Since its launch in 2014, HCCI has been working to dispel myths that were

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initial barriers to local adoption, including perceptions that low cost means low quality, that a medical tourism institution would not serve locals, that Indian doctors weren't as good as Western doctors and might not speak English (the HCCI care team now has Spanish speakers, too), and that the hospital would only offer telemedicine. To help address these misconceptions, HCCI provided care to a few notable Caymanians, who then became local advocates for the hospital.

As volume increases, HCCI plans to expand its specialties. New, diverse services have been commissioned, including medical oncology, spine surgery, bariatric surgery, and a sleep lab; sports medicine, radiation, and surgical oncology are coming soon. A cancer institute is expected to be operational by mid-2016. The long-term plan also includes expansion to 2,000 hospital beds within 15 years; a medical university; and a 1,500-unit assisted living facility, which will serve people needing day-to-day medical supervision, as well as healthy retirees wanting health care services nearby. Pharma-tourism—people willing to travel to purchase cheaper medicines—is also seen as a potential growth area.

Most NH hospitals in India break even in 30 months. HCCI is expected to achieve positive earnings before interest, taxes, depreciation, and amortization during the last quarter of 2016. While any analysis of sustainability is speculative at this stage, HCCI is well-positioned both geographically and as a brand to change the cost and process of surgery for the Americas and the Caribbean. However, sustainability will depend on the company's ability to drive up patient volume in all clinical areas. To accomplish this, the hospital will need to gain significant traction in the surrounding markets. It may introduce more diverse medical offerings outside of the NH core service structure, as noted above. The staffing model is sustainable in the medium term, as long as recruitment from India continues unabated.

EVIDENCE OF IMPACT

The NH model has been rigorously studied, and the impacts in clinical quality, health care access, health outcomes, and efficiencies are well documented in peer-reviewed literature. In 2007, NH was responsible for 12 percent of all cardiac surgical procedures performed in India, with 25 procedures completed daily, six days per week.^v The high-volume model means that each NH surgeon does 400 to 600 procedures annually, while U.S. surgeons perform 100 to 200.^{vi} As noted above, surgeons quickly develop tremendous domain expertise, resulting in excellent patient outcomes that rival those in the United States. For example, NH reports a 1.4 percent mortality rate within 30 days of coronary artery bypass graft surgery (CABG), compared with 1.9 percent in the United States.^{vii}

Although it's too early to analyze data for HCCI's health outcomes, the relevant cost advantage is evident. At the time of writing, HCCI's completed procedures are primarily in cardiology

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(62%) and orthopedic surgery (23%), with 11 percent in cardiac surgery and 4 percent in other specialties. HCCI's bundled pricing structure is typically set at 30 percent to 50 percent of U.S. fees for the same procedures; for example, CABG typically costs \$100,000 or more in the United States, while HCCI charges around \$25,000. HCCI is focused on expanding services and reducing costs further, with the ultimate goal of providing CABG for \$15,000 and joint replacement surgeries for \$10,000.

Researchers at Stanford University are developing a time-driven, activity-based costing model that allows them to measure the cost of each part of the patient encounter at NH, from walking in the door through follow-up. Colleagues at Duke University are working with HCCI to develop a similar model. This will allow HCCI to identify the cost drivers for each department and procedure and will support efforts to measure and improve efficiency.

HOW CAN THE INNOVATION BE ADOPTED TO WORK IN THE UNITED STATES?

It is unlikely that the NH model could be replicated wholesale in the United States, due to the regulatory and work culture changes that would be required. However, by replicating aspects of the system-wide efficiencies of the model, U.S. hospitals could see significant cost savings. The unrelenting focus of the NH and HCCI models to find efficiencies in every aspect of the operating model could, with strong leadership, be adopted by U.S. health providers.

While U.S. regulations around licensure and scope-of-practice laws may inhibit the adoption of many of NH's efficiency strategies, there is opportunity to explore the cost-saving potential related to task shifting. Advance-practice providers such as nurse practitioners can complete nearly all aspects of the surgical process, including wound closure, and the surgeon's time could be used exclusively for tasks only a surgeon can conduct. This process, combined with an assembly line approach to patient throughput, could clear bottlenecks in the surgical process and lead to higher volumes, better quality outcomes, and cost reductions.

Another example is transparency of costs across the organization. At NH, each receptionist, billing specialist, nurse, lab technician, and physician knows the cost of every material they use and every procedure they recommend. With the time-based activity costing model being developed at HCCI, staff will also soon be able to know the cost of each aspect of the patient encounter and how they can reduce that cost through simple efficiencies. There is growing interest in bringing greater transparency to U.S. health care pricing, and these efforts could be informed by the NH and HCCI models. Cost data could motivate members of U.S. care teams to participate in cost-reduction strategies, particularly if aligned with a service mission, as it is at NH: reducing cost of care means that more people can receive high-quality care.

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HCCI brings the NH model of high-quality, low-cost specialty care within a few hours of U.S. patients and offers a dramatically frugal alternative to U.S.-based care. Surgical treatment of cardiovascular disease, cancer, and orthopedic conditions (including joint replacements) are top drivers of health care expenditures in the United States, and demand will increase with the growing aging population. A U.S. insurer could offer to cover the entire cost of travel for the patient and a companion to Grand Cayman, surgery at HCCI, and postoperative care at home, and still save half the average fees of the procedure in the United States. If U.S. providers don't become more efficient and less costly, payers will be tempted to send insured patients to the Cayman Islands, putting competitive pressure on U.S. hospitals.

U.S. health insurers and consumers are clearly interested, if tentative, and medical tourism companies are emerging to facilitate cost-saving surgeries at HCCI and other global locations. Self-insured companies are likely to test the model first, because they have the clearest financial incentives, but other payers may follow as payment structures and incentives shift toward a focus on reimbursement for outcomes versus fee-for-service models.

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APPENDIX
ADDITIONAL DETAIL ON THE HEALTH CITY CAYMAN ISLANDS MODEL**

Business Model

The mission-driven approach of NH to serve all patients, regardless of ability to pay, is made sustainable by driving operational costs down through unique process efficiencies, ensuring high patient volumes at all times, and attracting a high proportion of full-pay patients through quality outcomes and low cost. The HCCI venture seeks to replicate this success, but adjustments to the business model were necessary to meet the different target population, payer mix, and operating environment.

The cost of building and launching the HCCI hospital was \$70 million, funded through a mix of debt and equity; this does not include the cost of future stages. The model's major cost drivers are personnel, supplies, and overhead. Compared to India, the cost of utilities, personnel, and supplies are far higher in Grand Cayman, and many of these costs will remain higher. Some operating costs, however, will be reduced over time by economies of scale and development of more efficient supply chains.

Because the cost of the most expensive personnel (managers and surgeons) is fixed regardless of surgery volume, staff is the primary cost driver for HCCI. To keep staff as lean as possible during the start-up phase while patient volumes are low, senior-level clinical and managerial staff are expected to hold multiple roles.

NH has built reliable low-cost supply chains in India over the past decade and leverages economies of scale to drive prices down further. HCCI has capitalized on this and procures most supplies directly from India. The added time and unpredictable nature of sea transport complicates inventory management but, even with transport costs, the price is a fraction of what comparable supplies would cost from other markets. Medicines are procured from FDA-approved companies in India when possible, and the remainder come from the United States or the United Kingdom, through NH's existing supplier relationships. As patient volumes increase, HCCI expects to shift from on-demand orders to streamlined bulk orders, improving efficiency. True to the NH model, HCCI doctors are aware of supply costs and are involved in the acquisition process to ensure they include cost in their decisions and avoid unnecessary expenses.

Utilities, such as water and electricity, are another major cost for HCCI; they are far more expensive in the Cayman Islands than in India. To address this, HCCI recycles water for reuse and is planning a solar farm.

The NH business model is designed for the Indian context in which the majority of health expenditures are out of pocket (58 percent of total health expenditure) and the majority of patients self-finance their care.¹ To serve the Cayman Islands and Latin American markets, where the majority of people are insured, HCCI must adjust its pricing, billing, and marketing strategies to the preferences of insurance payers. Whereas NH pricing is transparent, HCCI does not publish prices because it needs to allow for negotiation with insurance companies. HCCI uses bundled, fixed pricing, rather than billing by codes, and

¹ World Health Organization Global Health Expenditure Database.

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typically sets prices at one-third to half of average U.S. prices. Eschewing current procedural terminology (CPT) codes in favor of bundled pricing for procedures results in significant efficiencies for HCCI (it employs only two billing staff for the entire hospital) and caps risk for insurance companies. The bundled procedure price includes consultations, preoperative and postoperative investigations, admission charges, surgical fees, operating room fees, anesthesia, implant costs, room and food charges, medications and surgical consumables, transportation, and all physician visits up to two weeks post-op.

While bundled pricing is attractive in theory to U.S. insurance companies, HCCI has learned that, in reality, most insurance companies still want to receive itemized bills to match U.S. billing codes. Another challenge that HCCI faces in dealing with insurance payers is long wait times for payments. NH reports that the current average for NH Cardiac Hospital is over 70 percent cash payments directly from patients, with payments received at the time of service. However, HCCI faces 45- to 50-day waits to receive payment after billing insurance companies, making cash-flow management more difficult. A key question for patients and insurance companies that HCCI must address is postoperative support for medical tourists. HCCI helps insurance companies and patients find resources near their homes.

Staffing Model

Like NH, HCCI utilizes lean management principles, and staffing is planned according to minimum requirements based on patient volume. The HCCI staff typically wear multiple hats (e.g., head of internal medicine also heads pharmacy and a pulmonologist also heads infection control), which is partly a function of current volume, but also reflects a cultural ethos HCCI sought to replicate by bringing teams from India. A willingness to do what is asked of you, regardless of your formal role, is a key component of NH culture and is familiar to the Indian staff, most of whom trained at NH in India. Ability to balance multiple tasks is a key criterion in selecting candidates for HCCI. Internal hiring is also prioritized, to maintain the strong organizational culture.

Employee Category	Caymanian	Indian	Others	Total
Administration	18	24	4	46
Doctor	1	21	0	22
Nursing	3	33	0	36
Paramedics	3	29	2	34
Support Services	24	0	1	25
Total	49	107	7	163

There are currently 163 employees at HCCI, with 107 (about two-thirds) recruited from India (see table). All clinical staff are currently recruited from India, in part because there is not sufficient local capacity for the high-end, specialized care that HCCI offers, and also to ensure

brand fidelity and work culture in the replication. HCCI has an agreement with the Caymanian government allowing them to source clinical staff from India, providing flexibility to draw from a large labor pool in India and to structure agreements based on needs. For example, HCCI can set up short-term agreements to meet demand predictions. Most contracts are renewable two-year terms, which staff prefer. Being recruited to HCCI is viewed as an excellent professional development opportunity.

HCCI has committed to the Caymanian government to maintain a minimum of 25 percent to 30 percent local employees (currently at 30 percent). To meet this goal long term, HCCI has implemented an

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aggressive student intern program with 199 student interns this year and an anticipated 300 next year. Historically, the primary industries on the island are banking and tourism, with little emphasis on sciences. HCCI is working with the government to develop a long-term strategy to increase science curriculum and exposure to health care professions. In 15 years, HCCI plans for one-third of its staff across all categories, including clinical, to be Caymanian.

Policy and Regulatory Changes Made to Enable HCCI's Model

The Caymanian government worked with NH and Ascension to change laws and regulations to enable the adaptation of the NH model to the Caymans. Changes were made to the following nine laws, which were implemented through changes to 13 regulations.

1. Health Practice Law
2. Tort Reform Law
3. Organ Transplant Law
4. Organ Importation Law
5. Planning Law
6. Customs Law
7. Immigration Law
8. Registered Land Law
9. Local Companies Control Law

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^{vi} Govindarajan and Ramamurti, "Delivering World-Class Health Care, Affordably," 2013.

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