



## Case Study

Task shifting in surgery: Lessons from an Indian Heart Hospital<sup>☆</sup>Budhaditya Gupta<sup>a</sup>, Robert S. Huckman<sup>b,\*</sup>, Tarun Khanna<sup>a</sup><sup>a</sup> Harvard Business School, USA<sup>b</sup> Harvard Business School and National Bureau of Economic Research, USA

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## ABSTRACT

We present a case study that illustrates task shifting, the transfer of activities from senior to junior colleagues, in the context of cardiac surgery at the Narayana Health City Cardiac Hospital (NH) in India. The case discusses the factors driving the adoption of task shifting at NH and identifies the implications of task shifting for surgeon training, surgical capacity, and procedure costs. A comparison of the outcomes of two senior surgeons with similar experience, workload, and patient profiles—but varying in their level of task shifting—suggests that shifting of lower complexity tasks by senior surgeons to trained junior colleagues does not negatively impact in-hospital mortality and post-procedure length of stay. The study concludes with a discussion of task shifting's potential to improve access to affordable tertiary care in resource-constrained settings.

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## 1. Background

An open question in many healthcare settings is the extent to which specific tasks can be shifted from senior to junior colleagues so as to reduce cost without compromising quality. This study examines the feasibility of such task shifting in tertiary surgical care through a two-month field study of the Narayana Health City Cardiac Hospital (NH), a leading heart hospital in Bangalore, India. Task shifting is one of the critical enablers allowing NH to perform approximately 5000 adult cardiac surgeries each year—including roughly 2400 coronary artery bypass graft (CABG) procedures at a price<sup>a</sup> of between \$2000 and \$3000 per case. In contrast<sup>b</sup>, a typical large hospital in the United States might perform between 600 and 1800 cardiac surgical cases per year with CABG charges exceeding \$100,000 per case.<sup>1–3</sup>

This case illustrates the practice of task shifting during cardiac surgeries at NH and uncovers a set of insights related to the rationale for and impact of task shifting. The case specifically explores several questions: Why and how did NH adopt task shifting? What are the implications of task shifting at NH? To what

extent can task shifting be adopted in other resource-constrained, tertiary care settings?

## 2. Context

Heart disease is one of the leading causes of death worldwide and one of its most-common forms is atherosclerotic coronary artery disease (CAD).<sup>4</sup> CAD patients who are deemed unlikely to benefit from lifestyle changes, medication, or non-invasive procedures often undergo a coronary artery bypass graft (CABG) surgery, where a vein or artery from another part of the body is used to create an alternate path (or bypass graft) for blood to flow around an arterial blockage.

The main phases of a CABG procedure are as follows: induction, chest opening, vein/artery harvesting, main procedure, and chest closure. Induction involves preparing the patient for surgery. Chest opening consists primarily of activities such as skin incision, opening both the sternum, or chest bone, and pericardium (a sac that covers the heart) to access the heart. Vein/artery harvesting focuses on obtaining the saphenous vein from the leg, the radial artery from the arm, or the left internal mammary artery (LIMA) from the chest for creating the grafts. The main procedure is the phase where the two ends of the graft are constructed, referred to as anastomosis, and requires considerable surgical skill and judgment. Finally, chest closure involves closing the sternum, subcutaneous layer, and skin prior to transporting the patient from the operating theater (OT) to the intensive treatment unit (ITU).

The primary tasks performed by surgeons during a CABG are chest opening, LIMA harvesting, main procedure, and chest closure. The anesthesiologists induce anesthesia and monitor the condition of the patient (e.g., heart rate and blood pressure) during the procedure, a

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<sup>a</sup> Refers to price paid by patient. Internal cost for a CABG at NH are approximately \$1500–\$1600.

<sup>b</sup> The difference in volume can be explained in terms of both the number of surgeons (10 at NH versus three to six at a typical large US hospital) and the average number of cases per surgeon per week (10 at NH versus four to six in US hospital).

junior surgeon or physician assistant or operating room nurse typically harvests the saphenous vein and radial artery, and the scrub nurse or junior surgeon assists the surgeon. In the event a heart-lung machine is used to maintain blood circulation and oxygenation during the main procedure, a perfusionist is present to operate the machine.

It is estimated that one half of the approximately 120,000 cardiothoracic surgeries performed each year by 1400 cardiothoracic surgeons across roughly 250 hospitals in India are CABGs. These figures are particularly small relative to the estimated need of between two and three million cardiothoracic surgeries for the 30–35 million CAD patients in India.<sup>5,6</sup> More importantly, most of the available healthcare delivery infrastructure and capacity in India are targeted toward the urban affluent, making access a particular problem for indigent and rural populations. In comparison, there are approximately 3000–4000 cardiothoracic surgeons spread across the roughly 1000 hospitals in the US that perform cardiac surgery.<sup>7,8</sup> The Centers for Disease Control and Prevention website indicates that, in 2010 alone, approximately 400,000 CABGs were performed in the US.<sup>9</sup> This number does not include other cardiac surgeries such as valves, aneurysms repairs, and transplants. The resource constrained nature of cardiac surgery is obvious if one compares the number of cardiac surgeons and surgery centers in India to the corresponding numbers in the US, especially considering that the US population of 320 million is about one-fourth that of India's 1.2 billion.

The gap between the demand and supply of cardiac surgery in India was much greater in the mid-1990s, when approximately 3000–4000 CABG surgeries were being performed per year in a limited number of cities in India, and the total population of India was 850 million people. Moreover, these surgeries, typically priced at \$3000–\$4000, were unaffordable for most Indians, especially those in the large indigent population. Within this context, NH opened its doors in 2001 with the goal of providing affordable healthcare to the masses in India and quickly faced a heavy load of incoming cardiac patients.<sup>10</sup>

### 3. Problem

At the time NH was founded, the hospital's leadership realized that delivering high-quality outcomes would require offering the NH senior surgeons salaries that were consistent with market rates in India. At the same time, it was important to ensure that these salaries did not prevent NH from offering care to the indigent populations it aimed to serve. This resulted in an acute form of the common tension between care quality and cost. This problem was further exacerbated by the heavy inpatient and outpatient workload placed on the limited number of NH surgeons.

### 4. Solution

Different surgical tasks during a CABG require varying skill levels and decision making ability. Some tasks, such as chest opening, chest closing, and saphenous vein harvesting, fall towards the lower end of the complexity spectrum. More-complex tasks, such as anastomosis during the main procedure, require that the cardiac surgeon be assisted by a clinical staff member standing on the other side of the operating table. Since the development of modern open-heart surgery in the 1950s, it has been common for junior surgeons, keen on developing their surgical skills, to assist the senior surgeon on complex tasks and take the lead on the least-complex tasks, such as skin incision and chest closure.

The senior surgeons at NH argued that if they performed only on the main procedure during a CABG surgery, they would then have ample time to attend to other patients in the outpatient

department, inpatient ward, or intensive care unit. This approach would allow NH to take on a larger number of patients and thereby reduce the average cost of a surgery, as NH surgeons were salaried and not reimbursed based on number of surgeries performed. As a result, senior surgeons began to assign greater responsibility to the junior surgeons who were assisting them in the operating room. As various senior surgeons adopted this approach, each would explore issues such as what tasks could be done by the junior surgeon, how could the junior surgeon's activity scope be increased over time, and how long the senior surgeon could be outside the operating room. Co-location in adjacent operating rooms allowed both senior and junior surgeons to observe and learn from each other. As the junior surgeons developed into independent senior surgeons at NH, they adopted a similar approach and thereby institutionalized the practice of task shifting at NH.

Over time, an effective and stable approach to task shifting has emerged at the hospital. The standard approach at NH today is to have one senior and one junior surgeon involved with each procedure. Prior to the surgery, the senior surgeon explains to the patient and his or her family exactly which tasks he will perform and which ones will be performed by other members of the surgical team. One senior surgeon remarked, "We have a wonderful gift to be able do what we do – save lives. If we can see more patients and do more surgeries in a day with help from others, we have just managed to get more out of our skill and knowledge and make a bigger impact. Which surgeon would not want to do that?"

Our fieldwork suggested that the success of NH's task shifting approach has been to a large extent determined by the preparation, or rather the lack thereof, of junior cardiothoracic surgeons for independent practice at the completion of their residency programs. Cardiothoracic training in India follows a six-year format in which surgical residents complete a three-year general surgery residency (MS/DNB) followed by a three-year thoracic surgery residency (MCh/DNB).<sup>5,6</sup> In our discussion with NH surgeons, we repeatedly heard that cardiothoracic residents often do not get sufficient opportunities to perform, even under supervision, critical CABG surgical tasks such as LIMA harvesting and grafting. Thus, it is common for young cardiothoracic surgeons in India to work for a few more years after residency under the supervision of a senior surgeon to develop necessary skills. We note that junior surgeons at NH tended to view task shifting primarily as an opportunity to learn by participating in a high volume of complex cases with experienced senior surgeons. As a result, task shifting at NH did not appear to create any significant challenges related to the professional motivation of junior surgeons.

The time for a junior surgeon at NH to develop the set of skills required to be an independent senior surgeon typically varies from four to six years beyond the end of residency. The first four to six months of this period are marked by training under supervision resulting in a rapid, sequential handover of the more-routine surgical tasks (i.e., everything except the main procedure) to the junior surgeon. Subsequently, the junior surgeon continues to perform these transferred activities independently, while also assisting the senior surgeon during the main procedure. This intermediate, multi-year "steady" phase typically involves no additional task shifting but rather leverages the senior surgeon's time by allowing him to meet new patients or participate in other concurrent surgeries. Finally, during the last three-to-six months of the skill development period, the junior surgeon performs the main procedure under supervision of the senior surgeon. This staffing approach based on task shifting is not restricted to CABG procedures but has also been adopted extensively by the majority—though not all—of the NH surgeons for other cardiac surgeries, such as valve repair/replacement, aortic surgery, heart transplant, and pediatric procedures.

Our discussions with NH surgeons revealed that no internal or external (e.g., regulatory) approval was required to implement task

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