

## **SUSTAINABLE HUMAN HEALTHCARE: THE CENTRALITY OF INTRAPRENEURIAL NURSES**

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## SUSTAINABLE HUMAN HEALTHCARE: THE CENTRALITY OF INTRAPRENEURIAL NURSES

### ABSTRACT

Much is broken in the systems designed to deliver human healthcare. Without a fundamental reassessment, involving new sources of capable leadership, there is reason to doubt society's capacity to guarantee the availability of basic healthcare for future generations. Confronted by the "iron triangle" of cost, quality, and access, healthcare is awash in seemingly irresolvable tradeoffs. However, management research may provide some promising pathways, particularly through the implementation of internal processes that embody entrepreneurship. Towards this end, we develop and test the linkage between sustainability and intrapreneurship. Employing a matched pair sample of hospitals from diverse American cities, we investigate the extent to which intrapreneurial nurses influence healthcare outcomes. Our findings reveal that nurses are decisive in exerting material, positive effects on the sustainability of life-enhancing healthcare.

**Key Words:** intrapreneurship; sustainability; corporate entrepreneurship; healthcare solutions

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*"Healthcare, as we know it, is simply not sustainable. With growing realities including escalating costs and shifting market access models; stakeholder and regulatory scrutiny; low patient trust; and, an evolving physical environment threatening human health — the industry knows it needs to make itself more sustainable — but the answers might not be so easy to find."* – L. Xia (2017)

### INTRODUCTION

Human healthcare delivery is in dire straits (Cook et al. 2007; Himmelstein et al. 2018) and yet, management and organizational scholars have struggled to offer fresh insights (Gilmartin & D'Aunno, 2007), tenable theoretical frameworks (Kreitzer et al. 2015), or even partial solutions (Folland, Goodman & Stano, 2016) to the mounting crisis.

Although sustainability is most frequently discussed in terms of the environment, sustainable human existence involves developing long-term solutions to challenges involving four intimately related elements: environmental, social, economic, and cultural (Hacking & Guthrie 2008). Ultimately, sustainability is a matter of inter-generational fairness (Hunt & Fund 2016), involving present-day behaviors that give equally weighted consideration to future populations by taking into full account the quality of life they will experience (Weiss, 1990). Sustainability means that each successive generation depletes resources and generates behavioral outcomes in a fashion

that can continue indefinitely and without diminution of future peoples' quality of life (Daly, 1990). Gao and Bansal (2013) asserted that the key to sustainability is the emergence of an evolving mindset, migrating from the use of instrumental logics, which involve sequential decision-making and inflexible, exploitation-driven goals, to integrative logics that embrace the mutual aims of economic, socio-cultural, and environmental well-being.

In the realm of healthcare, the integration posited by Gao and Bansal has proved elusive, particularly in the U.S. (Gilmartin & D'Aunno, 2007). Shifting demographics, stark economic realities, and the inability to identify, develop, and leverage key resources have thrown into doubt the ability to deliver basic healthcare services to the even the most susceptible populations (Prowle & Harradine 2015). Although "[...] no single influence can account for any such complex phenomenon," noted Baumol (1993: 19), "low productivity growth in the personal services...where human touch is crucial" is the source of much of the "cost disease" in healthcare." The formidable task of successfully addressing these impediments and curing the "cost disease" has proved daunting (Hartwig, 2008). Sometimes referred to as the "iron triangle" of cost, quality, and access (e.g. Burns & Muller, 2008), healthcare is awash in seemingly irresolvable tradeoffs.

The purpose of this paper is to investigate the barriers to sustainable healthcare, which we attempt to address in the same fashion that all approaches to sustainability must: with decision-makers and stakeholders who discover and implement novel solutions to persistent problems, without regard to the resources immediately available; in short, innovating entrepreneurs. The central question of our inquiry is: Who are the innovating entrepreneurs of healthcare and how can they be empowered and unleashed to have a transformative impact on cost and quality?

Our study is among the first to apply the principles of entrepreneurial orientation (EO) (Covin & Wales 2012, 2018; Lumpkin & Dess, 2011; Pearce et al. 2010) and intrapreneurial behaviors (Antoncic & Hisrich 2001) to clinical settings in order to isolate and analyze the direct

impacts of EO and intrapreneurship (Parker, 2011) on the two most important dimensions of sustainable healthcare: healthcare outcomes and costs. Using a mixed methods approach with a pairwise analysis comparing sets of intrapreneurial and non-intrapreneurial hospitals in sixteen diverse American cities, we provide a richly detailed portal to the key drivers of sustainable healthcare. We contribute new insights concerning when and how the problems of Baumol's cost disease in healthcare (Hartwig, 2008) can be addressed by empowering those who are best equipped to provide much-needed innovations at the times they are both needed. When such behaviors become the norm, then sustainability becomes attainable.

### **THE STATE OF U.S. HUMAN HEALTHCARE**

Humans face peril on multiple sustainability fronts (Hunt & Fund, 2016), many of which appear to be irreversible: environmental degradation, spiraling sovereign debt, the acts and outcomes of warfare, access to and quality of educational opportunities, the adequacy of basic infrastructure, and, as noted above, human healthcare. Yet, unlike other sustainability challenges, the human healthcare crisis cannot be addressed by simply moderating the consumption of finite resources. Healthcare, like other service industries faces an uphill battle to contain cost increases since productivity levels are largely dependent upon human labor that can be augmented but not entirely replaced by automation and technology (Baumol, 2012). In these cases, the resulting wage increases will far outpace productivity gains in service firms and the resulting cost pressures as a "cost disease" that cannot be easily cured in service-oriented industries like healthcare (Baumol & Bowen 1966; Baumol, 1993). Instead, the lack of productivity gains combined with the exponential growth in the consumption of finite resources will tend to drive costs higher (Gillion & Lloyd 1994).

Health reform worldwide is urgently required due to a multiplicity of vexing conditions: aging populations, widespread chronic disease, and steadily rising costs (Orzog & Emmanuel

2010). In fact, by 2050, the number of people aged 65 or older is expected to nearly triple to about 1.5 billion, representing 16% of the world's population, as a result of declines in both fertility and improvements in longevity. Unsurprisingly, as Baumol and Bowen (1966) predicted, exponential increases in demand for healthcare have precipitated spiraling costs. In 1980, healthcare expenditures were \$256 billion, according to the Centers for Medicare & Medicaid Services. This sizeable figure represented just over 8% of the Gross Domestic Product, but is a pittance compared to more recent figures. In 2010, U.S. taxpayers spent \$2.6 trillion for healthcare services, representing a *tenfold increase* in a single generation (Berwick & Hackbarth 2012). In addition to the physical pain and suffering, patients face dire financial circumstances from healthcare costs. 60% of bankruptcies in the U.S. are due to expensive medical bills (Himmelstein et al. 2018; Nembhard 2009; Vogus, et al. 2010). In effect, as noted primary care doctor, Steffie Woolhandler observed, "Unless you're a Warren Buffet or Bill Gates, you're one illness away from financial ruin in this country" (Tamkins, 2009).

## THEORETICAL DEVELOPMENT

As the foregoing discussion demonstrates, struggles to resolve Baumol's "cost disease" in human healthcare delivery raises the importance of healthcare providers operating at the front lines of the industry to create fresh new innovations. The question is: How will this be done and who has the willingness and ability to do it? In the following section, we delve into the notion of EO as it is made manifest through intrapreneurial mind-sets and behaviors. Then, we explicitly assess the prospect of nurses playing this essential role, concluding with three propositions concerning the relationship between intrapreneurial nurses and sustainability aims.

### Entrepreneurial to Intrapreneurial Human Healthcare

While the demand for healthcare services escalates and the costs to deliver that care is "spinning perilously out of control," differential quality of care has created a growing divide

between “haves” and “have-nots” (Kogan et al. 1995). Healthcare systems will need to innovate to deal with the ramifications of these changes, which include increased rates of the elderly diseases such as dementia, diminished resources as working-age populations decline, and increased demand for long-term care. Innovations will be vital if these challenges are to be met, especially since human healthcare now constitutes one-sixth of the U.S. economy and appears to be clinically and financially broken. The question we pose is this: Is there such a thing as healthcare entrepreneurship; and if so, can it contribute to sustainable human existence?

The management field is far from silent on the critical matter of human healthcare. For example, scholarship in organizational development has embraced the healthcare sector in manifold respects (e.g. Boss & Boss, 1989; Koberg, Boss, Senjem & Goodman, 1999), including studies that have taken up both hospitals and nurses (Aiken & Patrician, 2000). However, this work has not generally taken a multi-level approach to an assessment of healthcare organizations’ entrepreneurial culture and actions. In adopting the vantage point of hospital change agents as internal entrepreneurs (Antoncic & Hisrich 2001; Burgelman 1983; Covin, Garrett, Kuratko & Shepherd, 2015; Parker 2011), our study investigates the extent to which a hospital’s entrepreneurial orientation (EO) may play a role in achieving superior patient care outcomes. Following Pearce, Fritz, and Davis (2010:219), EO is defined as attitudes and behaviors that have the qualities of “innovativeness, proactiveness, competitive aggressiveness, risk taking, and autonomy.” EO is regarded by many scholars as being one of the most well-supported constructs comprising foundational entrepreneurship theory (Lumpkin & Dess, 2001; Covin & Wales 2012). And yet, EO has not been examined as a driver of healthcare outcomes.

In healthcare, as elsewhere, entrepreneurial individuals can have a transformative impact upon their organizations and customers by exploring, identifying and exploiting opportunities, creatively breaking patterns, taking and managing risk, and organizing and coordinating resources

(Covin, et al., 2015; Lega, 2009; Zahra & Covin, 1995). Importantly, entrepreneurship and opportunity exploitation do not necessarily imply the creation of new firms, but can also take place within existing organizations (Shane & Venkataraman 2000). This involves the concepts of *intrapreneurship* and corporate entrepreneurship, which we refer to as the practice of developing new ventures and strategic renewal within an existing organization in order to exploit new opportunities and generate valued financial and non-financial outcomes (Covin et al., 2015; Ireland, Covin & Kuratko 2009; Parker, 2011).

### **Intrapreneurship: Mindset and Behaviors**

Intrapreneurship is a relatively recent concept that focuses on employees of a company that have many of the attributes of entrepreneurs. An intrapreneur is someone within a company that takes risks in an effort to solve a given problem (Antoncic & Hisrich 2001; Parker, 2011), precipitate change, and improvement effectiveness or efficiency of the firm. Intrapreneurship differs from entrepreneurship and even corporate entrepreneurship in several important respects. The most important distinction involves the level of focus (Hisrich 1990; Wilson et al. 2012). While an entrepreneur should see the company as a vision from starting point to end; the intrapreneur is a facet of this broader vision. The intrapreneur works within the company to solve a specific problem. Thus, intrapreneurs should have more directly applicable skills for a given task. The intrapreneur will take risks, but within the context of his or her job in the company. Unlike the entrepreneur, the intrapreneur is not focused on the entire company, but rather processes within it. In this sense, intrapreneurship applies the 'start up' style of management (characterized by flexibility, innovation, and risk taking) to an established organization (Antoncic & Hisrich 2001; Hostager, et al., 1998). The objective is to fast track productive, self-initiated improvements by circumventing bureaucracy, artificial imperatives, and unwanted constraints to better service customer-stakeholders. In the context of healthcare delivery,

intrapreneurship involves proactive, patient-centric efforts to anticipate and forestall problems, and to swiftly and creatively mitigate those problems that cannot be anticipated.

Intrapreneurs are major contributors to increases in productivity within organizations. Like entrepreneurs, intrapreneurs take risks and find more effective ways to accomplish tasks. Intrapreneurs are the drivers of innovation within companies. They seek policies, technologies and applications that resolve barriers to productivity increases (Antonic & Hisrich 2001). When properly nurtured, an intrapreneur builds the aptitude to recognize and solve important problems while they build the skills necessary to one day start a company (Antonic & Hisrich 2001). Thus, the process of intrapreneurship requires autonomy and independence to truly investigate every angle of the given problem they are presented with (Hisrich 1990). Scholars and practitioners have both noted that attempts to exercise undue control over potential intrapreneurs tends to stifle the experimental and creative processes that might otherwise bear fruit for the stakeholders and the organization (Carrier 1994; Hostager et al., 1998). When given greater autonomy, intrapreneurs have been found to exert favorable influence on the innovation (Luchsinger & Bagby 1987) and productivity of an organization. Since they most frequently serve on the front lines of organizations they tend to see more clearly the opportunities for process improvements (Antonic & Hisrich 2001). Empirical research, primarily emanating from organizational development scholars -- many of whom focused their studies on the healthcare sector -- suggests that intrapreneurs are often the most fundamental component of an innovative organization; so much so, in fact, that intrapreneurs are one of the most effective conduits for problem solving, organizational change, and client service (Wilson et al. 2012).

And yet, for “nursepreneurship” to succeed, the freedom of nurses to think independently is crucial. To achieve this an open-leadership style is required that encourages communication within and among nursing teams, problem identification, 'lateral thinking' and experimentation - features that constitute the essence of entrepreneurial orientation and intrapreneurial behaviors (White & Begun, 1998). As Govindarajan and Desai noted (2013:280), “Intrapreneurs can transform an organization more quickly and effectively than others because they are self-motivated free-thinkers, masters at navigating around bureaucratic and political inertia.”

### **The Centrality of Nurses**

Ultimately, any battle is won or lost on the front lines, and no group stands on the front lines of healthcare delivery more so than do nurses (Hewison & Badger 2006; Thompson & Yang 2009). With more than 80% of the entire healthcare workforce, nurses clearly comprise the single largest human resource dedicated to serving the healthcare needs in every country and virtually every healthcare context (Hayes, 2006). In the U.S., registered nurses constitute single largest certified profession with nearly 3 million workers (BLS, 2017). Aside from the sheer scale of the profession, nurses have a breadth and depth of front-line patient interaction and system-wide influence that is unparalleled in healthcare delivery (Wilson, Whitaker, Whitford, 2012). “Nurses are the glue of health care — whether treatment comes in an emergency room, doctor's office, med center, community clinic, homeless shelter or, especially, school clinic and nursing home. Precisely because they're always there, nurses are sometimes taken for granted” (UNMC, 2017). While there are no studies suggesting anything other than the fact that nurses are notoriously underpaid and overworked (Hayes, et al. 2006), it is not clear that they have been fully and amply deployed towards sustainable healthcare aims (Needleman et al. 2006). The entrepreneurial potential appears to be largely untapped (Cutler, 2011; Esterhuizen, 2006; McHarg, 2006). Thus, our primary aim is to investigate the premise that sustainable, ethical, and entrepreneurial solutions

to the healthcare crisis must necessarily embrace the centrality of nurses when developing, implementing, and supporting any such solutions.

Recent decades have witnessed a steady ascent in the complexity and magnitude of nurses' responsibilities, evidenced by the broadening scope of nurse training and deployment, especially through the development and implementation of advanced and specialist nursing roles and new models of practice (Buchan & Dal Poz, 2002). These expanded roles have been implemented in multiple care settings across the continuum of care from community or public health services and primary care, to acute care, and supportive or long-term care (Buchan & Dal Poz, 2002). In 2010, a landmark study by the Institute of Medicine (IOM), *The Future of Nursing: Leading Change, Advancing Health*, underscored the centrality of nursing contributions in finding that nurses will play a leading role in "...building a health care system that will meet the demand for safe, quality, patient-centered, accessible, and affordable care" (Institute of Medicine, 2010:1). Table 1 presents a composite perspective of the roles nursing have assumed in the context of modern healthcare delivery.

In addition to the sheer breadth and depth of involvement in each patient's well-being, Table 1 underscores the extent to which nurses shape critical dimensions of quality, affordable healthcare. As the Table reveals, all seven roles central to the nursing profession – and all three elements of the iron triangle -- actively engage sustainability, ethics, and entrepreneurship, including the urgent societal need to shift the focus from treatment to wellness and prevention (ANA 2017; UNMC 2017). This is consistent with the notion that has emerged through organizational research, demonstrating that "the innovative work behavior (IWB) of nurses, who are close to patients, is necessary if they are to be active participants in reaching organizational aims and, in a wider context, the aims of health care" (Afsar, et al., 2018:158; Liu et al., 2008; Knol & Van Linge, 2009).

\*\*\*\*INSERT TABLE 1 ABOUT HERE\*\*\*\*

The centrality of nurses with respect to the development and promulgation of sustainable human healthcare is well-supported through an analysis of multiple research streams addressing the issue. Scholarly journals cutting across diverse fields in medicine, management, public health, political science, economics, anthropology, gender studies, geography, sociology, and, of course, nursing, have variously arrived at a common set of stylized facts related to the relative influence by three key professional groups within healthcare: facility and policy administrators, physicians and nurses. While all three of these indispensable groups have highly inter-related functions, consistent evidence supports the notion that nurses are uniquely impactful in servicing sustainability aims. Figure 1 displays the perceived and observed impacts for healthcare outcomes and cost controls, each of which are essential to the achievement of healthcare sustainability aims (Hunt & Ortiz-Hunt 2018).

\*\*\*\*INSERT FIGURE 1 ABOUT HERE\*\*\*\*

While physicians and hospital administrators are perceived to influence clinical results and expense management, respectively, neither eclipses the influence exerted by nurses across each of these two dimensions. Sustainable healthcare, if it is to be achieved, requires the extensive involvement of all stakeholder groups (Center for MMS 2015), but it is apparent that little can be accomplished without incorporating nurses in planning and effectuating change.

On these two inter-related bases – the essentiality of intrapreneurial behaviors and the central role of nurses in healthcare delivery – we have framed our investigation of sustainable healthcare delivery around three central propositions:

**Guiding Propositions for Our Inquiry**

*P1: Intrapreneurial programs for nurses will improve the quality of healthcare delivery.*

*P2: Intrapreneurial programs for nurses will reduce the cost of healthcare.*

*P3: Intrapreneurship among nurses is positively related to sustainable human healthcare.*

This, in turn, forms the motivating basis of our inquiry regarding the ability of intrapreneurial policies, practices, and processes to facilitate the achievement of sustainability aims.

## DATA, METHODS AND ANALYSIS

Any attempt to undertake an exhaustive examination of healthcare outcomes and costs is laden with exciting opportunities and daunting challenges. On the one hand, longitudinal, multi-level healthcare data is among the most voluminous of any industrial sector. On the other hand, much of the data is, by law, privacy-protected (Center for MMS 2015). Compounding the challenge is the reality that most hospitals are loathe to publicize sensitive areas of potential inadequacy (Needleman 2002), necessitating the development of a novel approach to data acquisition and design. Our study employed a mixed methods approach that combined a quasi-experiment (Eden 2017) and regression analysis, in a triangulating fashion (Olsen 2004). Quasi-experiments are field-based experimental designs characterized by pre-experimental equivalence, but not random assignment (Shadish et al, 2008). While the lack of randomness degrades internal validity, quasi-experiments provide far more compelling causal indications than observational methods that lack experimental treatments. Given the exploratory nature of our investigation, the most apropos research design consisted of a matched pairwise analysis that accentuated the contrasting influence of the experimental treatment, intrapreneurial nurses. Moreover, given the inherent pros and cons of quasi-experiments, and the relatively limited generalizability that accompanies analyses of small samples, we further tested the findings generated from our pairwise design by performing regression analysis, using bootstrapping techniques (Davison & Hickey 1997) to support model comparisons.

### Empirical Context

The purpose of our investigation is to explore the extent to which a hospital's entrepreneurial orientation, signified through active support for an intrapreneurship program, may serve as a meaningful antidote for the staggering cost and quality problems confronting human healthcare delivery (Lega 2009; Prowle & Harradine 2015). Absent significant improvements in both critical dimensions, human healthcare systems are unsustainable and the current consumption of finite healthcare resources will leave future generations worse off (Rittel & Webber 1973). As the foregoing discussion revealed, extant frameworks for organizational change (Dawson 1994) and intrapreneurial effectiveness (Antoncic & Hisrich 2001) propound the notion that change agents must be authentically empowered (McHarg, 2006), appropriately resourced, and highly proximal to people and issues most relevant to the underlying challenge. Although a multitude of factors influence the cost and quality of healthcare outcomes, a robust body of empirical work indicates that the nursing profession is uniquely situated to embrace and enact an entrepreneurial orientation and effectuate intrapreneurial behaviors. The question is: Do such programs matter? Given the sprawling and convoluted nature of healthcare problems, are intrapreneurial nursing programs a significant driver of lasting improvements? Turning to our pairwise set of matched hospitals, we posed three propositions, predicting respectively that an institution-wide focus on intrapreneurship among nurses would improve outcomes, control costs, and substantially close the sustainability gap in human healthcare.

### **Pairwise Analysis**

For our quasi-experiment, we worked with executives from five different public and private U.S. healthcare organizations to identify sixteen pairs of hospitals that had no fiduciary or organizational affiliation with one another, with each pair located in one of sixteen geographically diverse cities drawn from the top fifty metropolitan statistical areas. Analysis using matched set pairs is statistically valid to the extent that paired T-test procedures demonstrate the absence of selection

and information biases as well as the preservation of normality. Generally speaking, the central limit theorem is weak in small samples. Therefore, when analyzing small samples, the underlying population should be approximately normal, which is certainly the case across the 5,500 hospitals constituting the U.S. healthcare system. While drawing from the full population with these requirements in mind, great care was invested in matching hospital pairs that exhibited a high level of comparability. In the end, each pair was virtually indistinguishable in terms of size, patient demographics, treatment foci, age, nursing pay scale, and percentage of Medicare and Medicaid patients, as indicated in Table 2. As a treatment condition that is relevant to the role of nurses, we insured that one hospital in each pairing had taken steps to inculcate greater entrepreneurial orientation, proxied through the implementation of an intrapreneurship program for nurses that included a comprehensive profile of organizational change elements; training, evaluation, hiring, promotion, and performance recognition.

**\*\*\*\*INSERT TABLE 2 ABOUT HERE\*\*\*\***

Without exception, none of characteristics constituted a statistically significant mean difference, evidenced by t-Test values well below standard thresholds for statistical significance (Judd et al. 2011). In addition to these parameters, we insured that each pair had no divergence with respect to the following features: for-profit versus non-profit status; academic versus non-academic mission; health system affiliation; and, the extent to which each hospital provided social safety net services. The last parameter – particularly the impact of Medicare and Medicaid patient populations – is so important that additional steps were taken to control for material differences in this regard. Table 3 shows the breakout for these two government programs for each pair. Historically, elderly patients on Medicare and economically disadvantaged patients on Medicaid encounter more frequent and more complex illnesses (ANS, 2010).

**\*\*\*\*INSERT TABLE 3 ABOUT HERE\*\*\*\***

Although there were some unavoidable differences attendant to the difficult process of identifying two comparable hospitals in each of the sixteen cities, the contrasts are rarely material. Each hospital is well-within one standard deviation of the average for all U.S. hospitals and the aggregate averages of 41% Medicare and 17% Medicaid are almost exactly at the overall national averages for each program (Center for MMS 2015). Neither the intrapreneurial nor non-intrapreneurial hospital pools in the study are disproportionately burdened or assisted by the extent to which they service government programs.

### **Regression Analysis**

Matched pair analysis provides a micro-level comparison involving the quasi-experimental treatment condition of intrapreneurship among the nursing corps of hospitals. The liability of such an approach is that the small sample limits the generalizability of the findings. Accordingly, our research design incorporates regression models through which we can test each of our three predictions in the context of a complete set of control variables. In order to leverage the highly granular data contained in our relatively small pairwise sample, we performed resampling with replacement, using bootstrapping techniques (Athreya 1987).

*Dependent Variables.* To assess the extent of intrapreneurship's influence and its related outcomes, three separate dependent variables were employed: healthcare outcomes, cost controls, and sustainability. *Healthcare Outcomes* is a scaled value, ranging from 1 to 100, representing the percentile ranking for each hospital, based on 57 separate criteria used by the U.S. federal government to determine reimbursement rates for services rendered through Medicare patients. The specific criteria are found in Table 4. *Cost Control* is a measure of each hospital's relative costs incurred in the process of satisfactorily delivering specified healthcare outcomes. Higher values are better than lower values. The variable is scaled value ranging from 0 to 100, representing

the percentile rank relative to all other hospitals. *Sustainability*, the third D.V., is also a scaled percentile rank, ranging between 0 and 100. It is calculated taking into account each hospital's percentile ranks for healthcare outcomes and cost, measured relative to the performance of all other hospitals in the complete population.

**\*\*\*\*INSERT TABLE 4 ABOUT HERE\*\*\*\***

*Predictors.* The focal independent variable of our investigation – *Intrapreneurship Programs* -- involved working with the nursing corps of select hospitals to instill an intrapreneurial mindset and toolkit designed to promote customer-centric behaviors and proactive problem-solving approaches. Accordingly, we sought hospitals in sixteen cities, one of which had developed and implemented an intrapreneurship program for nurses (coded 1) and a matched pair hospital that did not institute intrapreneurial programs among its nurses (coded 0). Preliminary analysis of our pilot study indicated that the duration of the intrapreneurship programs was a material source of differentiation in outcomes, so we added predictors that tested for a linear relationship between program duration and a curvilinear relationship, represented by an inverted U-shaped effect. The former would apply if duration was directly related to steadily improving outcomes. The latter would be apparent if very new programs required some time and experience to achieve gains, while very old programs may show evidence of becoming complacent. Both duration scenarios were included in the models.

*Control Variables.* Research on the drivers of healthcare delivery outcomes and hospital performance (Brookhart et al. 2010) is broad and deep. Extant empirical studies have identified dozens of statistically significant variables, many of which are collinear. To balance exhaustive inclusion with parsimony, we selected broadly representative controls that produced the highest possible r-squared with the fewest possible variables. This set is reflected in the regression models,

and is comprised of multi-level measures of each hospital's size, age, governance, and financial condition, as well as patient and nurse demographics (Needleman et al. 2002).

### **Bootstrapping**

Given the granularity and expanse of the data we were able to collect, the 32 hospitals we examined constitutes a material improvement over prior efforts to conduct comparative analyses of quality and cost. Still, for a credible regression model containing a full set of established controls, the resulting degrees of freedom were too low for a reliable regression model; thus, requiring bootstrapping (Davison & Hinkley 1997). Bootstrapping is widely recommended when the theoretical distribution of a statistic of interest is complicated or unknown (e.g. Adèr, Mellenbergh, & Hand, 2008). Since our dependent variables are all based on nationally derived percentile rankings, the DVs are definitionally normally distributed; however, the underlying performance generating the normalized outcomes may be highly variant as it pertains to our focal phenomenon, intrapreneurship programs for nurses, for which there are no theoretical or empirical guideposts from which to determine that the underlying properties of the overall population. Under the exploratory conditions we faced on the central role of nurses in achieving sustainable healthcare, bootstrapping is a thoroughly adequate means to establish two vital dimensions of our pairwise analysis: materiality and directionality.

Bootstrapping is also a valued methodology to employ when the sample size is insufficient for straightforward statistical inference (Davison & Hinkley 1997) and when the small sample reduces statistical power in the presence of numerous predictive variables, as is the case in our regression models. Since the representativeness of our conclusions drawn from our matched pairs are a function of how well we were able to assemble comparable pairs across the sixteen geographically and demographically diverse cities, the matching process summarized in Table 2 suggests that individually and collectively the matched set is credible. Nonetheless, bootstrapping

is an advisable precaution to guard against distortions that can be caused by unwitting aspects of the specific sample that may not be fully representative of the population. Additionally, the use of bootstrapping is critical to attain sufficient statistical power, particularly since the reliability of the standard deviation for the variable of interest, *Intrapreneurship Programs*, is the primary reason for even using the regression model to stress-test the pairwise findings. Since the overall population of 5,500 U.S. hospitals has finite variance, the use of bootstrapping on our relatively small sample will generate additional power without running the risk that our underlying sample is “heavy tailed,” which would cause the model coefficients for the bootstrapped sample to be biased, or even spurious (Athreya 1987). By resampling 5,000 times (Efron & Tibshirani, 1994), we generate more than 150,000 observations with which to test our propositions, thereby establishing a credible groundwork for stress-testing both dimensions, even while the magnitude of the model coefficients would benefit from further testing under conditions that do not necessitate bootstrapping (Davison & Hinkley 1997).

## RESULTS

In the following sections, we conduct a detailed analysis of the matched pairs, followed by the analysis of regression models that we developed in order to investigate the magnitude and directionality of the focal effects across a bootstrapped sample of the hospitals in the context of a complete profile of theory-driven control variables. The dual approach allows us to test the predicted relationships at both a micro, pairwise level and a macro, population level.

### Pairwise Comparison

As discussed above, great care was taken to insure that our matched pairs draw upon substantively the same patient demographics and operate under identical macro-level constraints (Table 2), leaving entrepreneurial orientation and intrapreneurial programs as the differentiation.

We anticipated that the sixteen hospitals with intrapreneurship programs would provide better care would do so at a lower cost. As the results in Table 5 reveal, our predictions generally found support, though the underlying story has complex drivers and repercussions.

**\*\*\*\*INSERT TABLE 5 ABOUT HERE\*\*\*\***

Table 5 presents the national percentile (from 5,000 hospitals nationwide) for each hospital in the study. The scaled values indicate the percentage of hospitals performing below the percentile ranking for a given hospital. For example, in Pair 8, the hospital with an intrapreneurship program was in the 80<sup>th</sup> percentile of all hospitals ranked for patient outcomes, meaning that it has performed better than 80% of the nation's hospitals. Meanwhile, its matched pair - a hospital without an intrapreneurship program selected from the same metropolitan area - was in the 62<sup>nd</sup> percentile, fully eighteen basis points below its intrapreneurial pair. Overall, hospitals with intrapreneurial nurses had a mean ranking of the 76<sup>th</sup> percentile, compared to the 59<sup>th</sup> percentile for the matched hospitals without intrapreneurship programs. Figure 2 provides summary values.

**\*\*\*\*INSERT FIGURE 2 ABOUT HERE\*\*\*\***

Moreover, the variance was considerably lower for intrapreneurial hospitals: 13% on a larger base, versus 21% for the paired hospitals, suggesting balanced excellence. Every single intrapreneurial hospital outperformed its matched pair. Table 6 presents the key differences.

**\*\*\*\*INSERT TABLE 6 ABOUT HERE\*\*\*\***

The story is similar for cost controls, but with several key differences. For example, six of the sixteen hospitals with intrapreneurship programs under-performed their matched pair (1, 6, 7, 8, 11, 15), including a massive underperformance for Pair 11. Conversely, Pair 10 witnessed a 71 percentage-point advantage for the intrapreneurial hospital. Thus, cost controls exhibited much more variance than healthcare outcomes. Still, on average, hospitals with intrapreneurship programs were in the 62<sup>nd</sup> percentile of all hospitals, while their counterparts were, on average in

the 55<sup>th</sup> percentile. Digging deeper, the six intrapreneurial hospitals that underperformed had the shortest duration for their respective intrapreneurship programs. It is conceivable that, consistent with existing literature on organizational development (Dawson 1994), attempts to bolster entrepreneurial orientation through in-house initiatives to teach, recognize and reward intrapreneurial behaviors has a dislocating impact, short-term. While the data indicates that the impact of intrapreneurship on healthcare outcomes is immediate, the improvements to cost take longer to gestate. Hospitals may need to be patient in attaining higher quality at a lower cost.

The most important measure of intrapreneurship's impact in the blended assessment, taking into account both quality outcomes and the cost to attain those outcomes; in a word, sustainability. Hospital delivering outcome excellence in a cost effective fashion have the capacity to remain a viable, inter-generational contributor to the healthcare system (Wilson et al. 2012). Here, too, there appears to be a material impact exerted by intrapreneurship. As Table 6 reveals, the sixteen hospitals with intrapreneurial programs for nurses had a mean percentile rank of 72%, versus the sixteen comparison hospitals, which averaged the 52<sup>nd</sup> percentile. The twenty percentage-point difference between the two groups suggests that the mean effect of intrapreneurial programs is highly significant, and with considerably less variance (std. dev. of .16 versus .19). As Figure 3 shows, the hospitals with intrapreneurship programs consistently perform at a far higher level.

**\*\*\*INSERT FIGURE 3 ABOUT HERE\*\*\***

Only two of the sixteen hospitals with intrapreneurship programs performed below the paired hospitals, Pair 7 and Pair 11. In each case, the unfavorable delta was relatively small and in each case the two "underperforming" hospitals had intrapreneurship programs that had been in place for less than one year. Moreover, each of the two intrapreneurial hospitals had patient outcomes that were far higher than the matched pair. The other fourteen intrapreneurial hospitals outperformed each matched pair, often by an extraordinarily large amount (e.g. Pair 3 and Pair

10). Outperformance on the sustainability measure requires the cost effective delivery of quality outcomes across the 57 items constituting the comparative framework (Table 4).

### **Regression Analysis**

As the foregoing, pairwise analysis revealed, intrapreneurship programs designed to foster proactive, creative, customer-centric behaviors materially influence healthcare outcomes, cost effectiveness, and the sustainable delivery of healthcare. This pairwise investigation affords us an unparalleled perspective on how similar hospitals experience radically dissimilar results as a consequence of motivating and equipping nurses to be constructive change agents. However, intrapreneurship programs do not operate in a vacuum. Many factors – some controllable by hospitals, others beyond their direct control – exert an intervening influence that must be taken into account when seeking to establish the robustness of our pairwise analysis. In particular, it is critical to assess the extent to which our findings may be an artifact of the research design. While the pairwise findings are illuminating, the question remains: Are the results robust in the context of a full model of other relevant predictors related to patient cost and care?

Table 7 presents a correlation matrix for the variables comprising the analytical models used in the study (Descriptive statistics are in Table 2, above).

**\*\*\*INSERT TABLE 7 ABOUT HERE\*\*\***

The directionality and magnitude of the correlations is consistent with my central assertions about the relationships between the initiation of intrapreneurship programs and the outcomes related to cost and care. Interestingly, the age and size of a hospital are relatively uncorrelated with either the instigation of intrapreneurship or its results. Also noteworthy is the extent to which healthcare outcomes are more highly correlated with sustainability than is the direct ability to control costs. This may suggest that an excellent way to control costs is actually by delivering exceptional patient outcomes, since doing so guarantees that a hospital will be fully reimbursed by Medicare,

Medicaid, or other third-party insurers. If true, then some meaningful portion of cost control is contained within the variable for quality outcomes, a condition that bodes well for hospitals that are able to deliver quality outcomes.

One other correlation that is worth noting pertains to the percentage of Medicaid patients, which is inversely correlated with each of the three dependent variables. This is consistent with public health research indicating that Medicare recipients often face multiple, inter-related maladies that are costly to untangle and involve treatments that often have a lower success rate (Center for MMS 2015). It becomes interesting, then, to see if intrapreneurial programs have a material effect on the inherent challenges of delivering quality healthcare in a cost effective fashion to economically disadvantaged patients.

The regression results in Table 8 are arrayed by proposition. Models 1a and 1b test the proposition that intrapreneurship programs will be associated with higher mean healthcare outcomes. The D.V. in this case consists of each firm's percentile rank on the 57-part Medicare formulation for quality care. Models 2a and 2b examine the proposition that intrapreneurial nurses materially exert a favorable influence on cost controls, using a D.V. of percentile ranking for reimbursement rates to third-party insurers. Finally, Models 3a and 3b test the relationship between intrapreneurship programs and sustainability, which is balanced, blended percentile ranking of healthcare outcomes and cost of care. For each model comparison, a base-case set of controls is contrasted with model containing the indicator variable for intrapreneurship programs. After seeing that a program's duration had a material effect on comparisons in our pairwise analysis, we added predictors for the linear effects and curvilinear effects of program duration. The latter was included to see if, in addition to very new programs struggling to control costs, relatively old programs struggled with complacency.

In all three cases, the propositions found support, with material effect sizes and without variances that would cast doubt upon conclusions that intrapreneurial nurses are central to the achievement of gains in healthcare sustainability. Models 1b, 2b, and 3b, each demonstrate that over and above the effect of numerous societal, institutional, and individual factors, intrapreneurial nurses have a pronounced, positive impact on healthcare outcomes and the associated costs. Our models employ non-standardized coefficients in order to facilitate the interpretability of the coefficients. Thus, the institution of an intrapreneurship program for nurses is associated with a 7.27-point increase in a hospital's percentile rank for health outcome performance (Model 1b), which offers strong confirmation of pairwise results. Directionally and as an order-of-magnitude, program impacts for Models 2b and 3b are similarly large.

**\*\*\*\*INSERT TABLE 8 ABOUT HERE\*\*\*\***

While the challenges of handling disadvantaged patients are not eliminated in context of intrapreneurship programs, their relative impact is noticeably muted in Models 1b, 2b, and 3b. Since all of the control variables are mean-centered, we can interpret the direct influence of each variable with and without intrapreneurship programs. The extent of the influence is often stark. For example, without intrapreneurial nurses taken into account in Model 1a, each additional patient increase to a nurse's "load" decreases healthcare outcomes by 1.53 percentage-points. However, in the context of intrapreneurial nurses (Model 1b), the negative effect drops to -0.45 percentage-points. Similarly, in comparing Models 3a and 3b, each one-percentage point increase in the number of Medicaid patients has a -0.73 effect on sustainable healthcare with intrapreneurial nurses (Model 3a), but this adverse effect shrinks to -0.42 percentage points with intrapreneurial nurses (Model 3b). This demonstrates some of the specific ways in which intrapreneurship programs have a tangible impact on mitigating the adverse effects of common problems

encountered by hospitals seeking to achieve more sustainable human healthcare delivery and the centrality of intrapreneurial nurses in achieving those gains.

Overall, all three models display a highly significant  $\Delta R^2$ . For example, Model 3b – intrapreneurial nurses' influence on sustainable healthcare in the context of a complete profile of known controls – 18.9% of the sustainability variance is explained by intrapreneurial nurses. Put differently, nearly half of the unexplained variance of the baseline model (3a) is explained by the inclusion of intrapreneurship programs.

## 7. DISCUSSION

As noted from the very outset, defining and measuring “sustainable healthcare outcomes” is complex and elusive (Black 2013). In this investigation, we have taken it to mean that society ensures healthcare delivery for all people while achieving reductions in morbidity/mortality rates, and bringing healthcare costs to a level wherein they no longer generate externalities for future generations (Ferguson & Keen 1996; Hunt & Fund, 2016). Like so many other facets of human existence (Hunt, 2013, 2017), quality healthcare delivery to current and future generations involves the confluence of sustainability, ethics and entrepreneurship. Motivated by this complex challenge, we sought to investigate how innovative entrepreneurial action could be harnessed in curing Baumol's “cost disease” in healthcare. Fortunately, few industries generate more data than hospitals. The consequence of our investigation offers potent implications for scholars inside and outside management, and for practitioners inside and outside the healthcare sector.

### **Implications for Scholars**

The results of our pairwise analysis constitute an important conceptual and empirical push-back on attempts to minimize the role of institutional actors as internal entrepreneurs (Aldrich 2012). Extant literature suggests that nurses are at the front lines of controlling healthcare costs and influencing its quality (Wilson et al. 2012); a circumstance that holds promising insights for

organizational and management theorists who wish to examine how professional acumen and organizational proximity are more important than formal positional authority to impact not only a firm, but potentially an entire society. The focus on corporate governance cannot be meaningfully conducted without attentiveness to corporate “functioning” (Hunt, 2013, 2017; Hunt & Hayward, 2018). It is customers who determine where the locus of authenticity and value is derived, not the organization that provisions goods and services. In this regard, our cadre of intrapreneurial nurses elucidate vital elements regarding the value of enabling autonomous use of precious resources by those best equipped to make use of those resources.

Analysis of the quasi-experiment and big data quantitative analysis provide support our propositions related to the role of intrapreneurially-minded nurses playing a key role in achieving sustainable healthcare, that is: dramatically improved outcomes for a lower cost. Among the 32 paired hospitals, the treatment effect of intrapreneurial programs was associated with 37% fewer hospital days and 25% fewer return visits across fifty-seven different categories of healthcare quality. Moreover, hospitals with intrapreneurial nurses spent more time on post-operative patient education and displayed more than 50% higher nursing evaluations. Follow-on analysis of the quantitative study will help to assess the generalizability of quasi-experiment.

Scholars may also find applicability of these findings to other contexts, including those lying outside the healthcare domain (Hunt & Hayward, 2018; Hunt & Ortiz-Hunt, 2017, 2018). Any organization that endeavors to undertake significant change for the sake of both improved quality and reduced cost will gain insights from the complex cross-currents comprising healthcare delivery. Organizational development scholars have long noted the importance of inclusiveness (Bohmer & Lee 2009) and autonomy (Dawson 1994) in effecting meaningful change; yet, little research traces the comparative benefits for an organization and society through the treatment effects of such changes. Part of the problem stems from self-imposed methodological limitations,

which have in a sense been bi-polar. Most existing research is built either on highly detailed, micro-driven, single-case studies that offer veridicality but little in the way of intelligibility, or on high-level, macro-aggregated studies that are intelligible (Hunt, 2013), but not particularly veridical, meaning that they fail to aptly capture reality as it exists in hospitals. As an alternative, our approach balances veridicality and intelligibility in a fashion that may prove to be useful inside and outside the healthcare domain.

### **Implications for Practitioners**

For the many healthcare organizations that find themselves sinking in the quandary of conflicting aims and insubstantial strategies for provisioning quality, affordable healthcare, our findings offer a reassuring antidote, but not a silver bullet. The cultural changes required for the sixteen intrapreneurially minded hospitals to reconstitute themselves were substantial. As our analysis revealed, the early years post-adoption of intrapreneurship programs can be financially rocky, resulting in comparative underperformance, even while the healthcare outcomes show pronounced improvement. It is not uncommon for reengineered organizations to become more chaotic and less efficient in the very short-term (Dawson 1994; Hunt, et al., 2019). It may be important, therefore, for hospitals to prepare stakeholders for a five-year plan, during which improvements and shortcomings will be closely monitored, while reserving final judgement the critical dimensions of sustainability can be properly gestated. Hospitals electing to take the steps towards more autonomous, innovative nurses should also be heartened by the favorable impact intrapreneurial cultures have on employee retention, both in reducing overall turnover and in reducing the loss of the most valued employees. Such effects are likely to have long-lasting effects.

### **Limitations and Opportunities**

Research designs, particularly those investigating complex and convoluted, multi-faceted phenomena with diverse stakeholders, require methodological compromises. So, too, did this one.

As noted earlier, our decision to use a pairwise analysis stemmed from our motivating research questions, which sought to determine if intrapreneurship matters and whether nurses matter, when it comes to addressing the sustainability of healthcare delivery. Electing to use matched pairs enabled us to answer these questions at a level of analysis that had not been undertaken in extant literature. Our access to an unusually rich database from hundreds of hospitals made it possible to identify and pair healthcare providers in sixteen diverse cities that were distinctive only their respective approaches to intrapreneurial behavior by nurses. The rare optics afforded through this design decision offset concerns regarding the generalizability of a relatively small, though nonetheless representative sample. To stress-test our pairwise findings, we conducted a bootstrapped regression analysis. Doing so, gave us added insights regarding the role of intrapreneurial nurses when considered in the context of other, well-known drivers of hospital performance and costs. Both the pairwise analysis and bootstrapped regression models can and should be extended to additional contexts, sampling strategies and methodologies. Moreover, findings related to our focus on U.S. data should be treated cautiously when applied to healthcare contexts in other countries. The U.S. healthcare system, especially its labyrinthine financing schema, is notoriously idiosyncratic. Yet, not a healthcare system in the world functions without well-trained nurses. Only the specific nature of their centrality is likely to vary across contexts. Thus, future research will benefit from the three propositions we have tested in this investigation and the numerous others that are implied by our findings.

## **Conclusions**

Near the end of her life, Florence Nightingale (1894) said, “May we hope that when we are all dead and gone, leaders will arise who have been personally experienced in the hard, practical work, the difficulties and the joys of organizing nursing reforms, and who will lead far beyond anything we have done.” As the foregoing analysis reveals, nurses have much to contribute to each

of the most decisive dimensions in conducting the hard work related to sustainable healthcare delivery. Consistent with classical conceptions of sustainability (e.g. Daly 1990; Weiss 1990), we opened this paper by noting that it requires attention to and careful balancing of four dimensions: environmental, economic, social, and cultural. As a wicked problem, human healthcare inherently involves each of these four. As the Alliance for Natural Health (ANH) noted (2010), sustainable healthcare requires “interacting approaches to the restoration, management and optimization of human health that has an ecological base, that is environmentally, economically and [socio-culturally] viable indefinitely.” The challenge, however, has moved past the identification and education phase to finding applicable frameworks and definable, implementable tools (Hunt, 2017). Given the evolving nature of healthcare challenges and the perilous state of current condition, circumstances call for novel innovations lead by well-supported intrapreneurs; and, the vanguard of such an effort is constituted of nurses.

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**Table 1: Nursing Roles in Modern Healthcare**

Role in Healthcare Delivery	Healthcare Implications	SEE Dimensions	
1. Act as patient advocates	As the largest of the health professions — with the most patient contact — nurses are a voice for their patients and for broader reform.	Sustainability	●
		Ethics	●●●
		Entrepreneurship	●●
2. Form the hub of health care	Nurses are the hub connecting the whole medical team. Communicating expertly with doctors, pharmacists, therapists and other health professionals.	Sustainability	●●●
		Ethics	●●
		Entrepreneurship	●●●
3. Blend knowledge with nimble skills	Apply vast nursing knowledge backed by nimble skills in health informatics, medical technologies and hands-on procedures.	Sustainability	●●
		Ethics	●
		Entrepreneurship	●●●
4. Make critical care decisions	Routinely expected to exercise swift clinical judgment — to make key care decisions based on evidence and keen observation.	Sustainability	●
		Ethics	●●●
		Entrepreneurship	●●●
5. Shift focus to wellness & prevention	Nursing is predicated on health promotion, disease prevention and illness management — an affordable, proactive model.	Sustainability	●●●
		Ethics	●●●
		Entrepreneurship	●●●
6. Widen access to basic health care	Nurses are increasingly the first line of care, especially in small towns and underserved metro areas.	Sustainability	●●
		Ethics	●●●
		Entrepreneurship	●
7. Stand as sentinels of patient safety	Nurses must be vigilant in anticipating patient risks, acting quickly in preemptive treatment, & intervening to prevent medical errors.	Sustainability	●
		Ethics	●●●
		Entrepreneurship	●●●

Sources: American Nursing Assoc., Natl Association of Hispanic Nurses, and University of Nebraska Medical Center

**Table 2: Comparability of Pairwise Matched Pools**

	Hospitals with Intrapreneurship Programs	Hospitals without Intrapreneurship Programs	T-test	P Value
Hospital Size (Beds)	293	302	0.40	0.28
Hospital Size (Revenue - \$MM)	387	372	0.61	0.54
Hospital Age (Years)	17	19	0.65	0.52
Hospital Surgical Specialties (#)	31	29	0.33	0.74
Time Since Last Major IT Upgrade (Years)	3.3	3.5	0.18	0.86
Mean Utilization Rate (%)	99%	98%	0.69	0.49
Mean Annual Capital Expenditures (\$MM)	27	25	0.44	0.66
Debt to Capitalization (%)	41%	39%	0.41	0.68
Medicare Patients (%)	41%	41%	0.16	0.87
Medicaid Patients (%)	17%	17%	0.13	0.89
Insured Patients (%)	17%	17%	0.13	0.91
Charity as % of Total Expense	9%	10%	0.37	0.72
CEO Salary (\$)	812,000	799,000	0.21	0.83
Nurses Mean Prof Experience (Years)	18.3	21.2	1.42	0.17
Nurses Mean Tenure at Hospital (Years)	11.7	12.4	0.34	0.73
Nurses Mean Age (Years)	47.7	51.1	1.20	0.18
Nurses Mean Hourly Wage (\$/hr)	32.67	33.04	0.18	0.86
Nurses with B.S.-R.N. or Higher (%)	72%	69%	0.49	0.63

**Table 3: Medicare and Medicaid Populations for Matched Pairs**

Pairing	Medicare Patients		Medicaid Patients	
	Hospitals with Intra Prog	Hospitals without Intra Prog	Hospitals with Intra Prog	Hospitals without Intra Prog
1	39%	42%	20%	18%
2	50%	43%	16%	19%
3	55%	53%	13%	14%
4	34%	41%	15%	17%
5	41%	37%	18%	17%
6	43%	41%	13%	12%
7	53%	57%	20%	19%
8	42%	43%	15%	15%
9	29%	32%	12%	15%
10	49%	47%	36%	33%
11	36%	41%	14%	14%
12	32%	30%	17%	16%
13	44%	48%	14%	17%
14	41%	37%	12%	15%
15	38%	40%	16%	21%
16	33%	31%	20%	17%
<b>Total</b>	<b>41%</b>	<b>41%</b>	<b>17%</b>	<b>17%</b>

**Table 4: Criteria for Healthcare Outcomes**

<b>Mortality (7 measures)</b>	Death rate for heart attack patients	<b>Patient Experience (11 measures)</b>	Patients who reported that their nurses communicated well
	Death rate for coronary artery bypass graft (CABG) surgery patients		Patients who reported that their doctors communicated well
	Death rate for chronic obstructive pulmonary disease (COPD) patients		Patients who reported that they received help as soon as they wanted
	Death rate for heart failure patients		Patients who reported that their pain was well controlled
	Death rate for pneumonia patients		Patients who reported that staff explained about medicines before giving it to them
	Death rate for stroke patients		Patients who reported that their room and bathroom were clean
	Deaths among patients with serious treatable complications after surgery		Patients who reported that the area around their room was quiet at night
<b>Safety of Care (8 measures)</b>	Central line-associated bloodstream infections (CLABSI)	<b>Effectiveness of Care (10 measures)</b>	Patients who reported that they were given information about what to do during their recovery at home
	Catheter-associated urinary tract infections (CAUTI)		Patients who understood their care when they left the hospital
	Surgical site infections from colon surgery (SSI: Colon)		Patients who gave their hospital a rating on a scale from 0 (lowest) to 10 (highest)
	Surgical site infections from abdominal hysterectomy (SSI: Hysterectomy)		Patients who would recommend the hospital to their friends and family
	Methicillin-resistant Staphylococcus Aureus (MRSA) Blood Laboratory-identified Events (Bloodstream infections)		Patients assessed and given influenza vaccination
	<i>Clostridium difficile</i> (C.diff.) Laboratory-identified Events (Intestinal infections)		Healthcare workers given influenza vaccination
	Rate of complications for hip/knee replacement patients		Outpatients with chest pain or possible heart attack who received aspirin within 24 hours of arrival or before transferring from the emergency department
<b>Readmission (9 measures)</b>	Serious complications	Percentage of patients who left the emergency department before being seen	
	Hospital Return Days for heart attack patients	Percentage of patients who came to the emergency department with stroke symptoms who received brain scan results within 45 minutes of arrival	
	Rate of unplanned readmission for coronary artery bypass graft (CABG) surgery patients	Percentage of patients receiving appropriate recommendation for follow-up screening colonoscopy	
	Rate of unplanned readmission for chronic obstructive pulmonary disease (COPD) patients	Percentage of patients with history of polyps receiving follow-up colonoscopy in the appropriate timeframe	
	Hospital return days for heart failure patients	Percent of mothers whose deliveries were scheduled too early (1-2 weeks early), when a scheduled delivery was not medically necessary	
	Rate of unplanned readmission after hip/knee surgery	Patients who developed a blood clot while in the hospital who treatment that could have prevented it <i>did not</i> get	
	Rate of unplanned readmission for pneumonia patients	Percentage of patients receiving appropriate radiation therapy for cancer that has spread to the bone	
<b>Patient Experience (11 measures)</b>	Rate of unplanned readmission for stroke patients	<b>Timeliness of Care (7 measures)</b>	Average (median) time patients spent in the emergency department, before they were admitted to the hospital as an inpatient
	Rate of unplanned readmission after discharge from hospital (hospital-wide)		Average (median) time patients spent in the emergency department, after the doctor decided to admit them as an inpatient before leaving the
	Rate of unplanned hospital visits after an outpatient colonoscopy		Average (median) number of minutes before outpatients with chest pain or possible heart attack who needed specialized care were transferred to
	Patients who reported that their nurses communicated well		Average (median) number of minutes before outpatients with chest pain or possible heart attack got an ECG
	Patients who reported that their doctors communicated well		Average (median) time patients spent in the emergency department before leaving from the visit
	Patients who reported that they received help as soon as they wanted		Average (median) time patients spent in the emergency department before they were seen by a healthcare professional
	Patients who reported that their pain was well controlled		Average (median) time patients who came to the emergency department with broken bones had to wait before getting pain medication
<b>Patient Experience (11 measures)</b>	Patients who reported that staff explained about medicines before giving it to them	<b>Efficient Use of Medical Imaging (5 measures)</b>	Outpatients with low-back pain who had an MRI without trying recommended treatments first, such as physical therapy
	Patients who reported that their room and bathroom were clean		Outpatient CT scans of the abdomen that were "combination" (double) scans
	Patients who reported that the area around their room was quiet at night		Outpatient CT scans of the chest that were "combination" (double) scans
	Patients who reported that they were given information about what to do during their recovery at home		Outpatients who got cardiac imaging stress tests before low-risk outpatient surgery
	Patients who understood their care when they left the hospital		Outpatients with brain CT scans who got a sinus CT scan at the same time
	Patients who gave their hospital a rating on a scale from 0 (lowest) to 10 (highest)		
	Patients who would recommend the hospital to their friends and family		

**Table 5: Pairwise Percentile Rank Comparisons**

	Percentile Rank for Outcomes		Percentile Rank for Cost Control		Percentile Rank for Sustainability (Outcomes & Cost)	
	Hospitals with Intra Prog	Hospitals without Intra Prog	Hospitals with Intra Prog	Hospitals without Intra Prog	Hospitals with Intra Prog	Hospitals without Intra Prog
1	67%	48%	28%	44%	49%	34%
2	81%	74%	56%	49%	77%	60%
3	67%	13%	74%	51%	73%	26%
4	90%	74%	55%	37%	84%	48%
5	88%	61%	82%	68%	90%	52%
6	76%	74%	90%	92%	92%	85%
7	61%	37%	27%	49%	35%	44%
8	74%	72%	45%	51%	61%	47%
9	80%	62%	73%	55%	78%	58%
10	39%	21%	88%	17%	64%	16%
11	78%	54%	41%	84%	80%	82%
12	97%	80%	74%	72%	83%	75%
13	79%	75%	82%	58%	84%	61%
14	86%	85%	63%	41%	80%	57%
15	64%	49%	79%	88%	73%	52%
16	74%	57%	37%	31%	52%	35%
Avg	76%	59%	62%	55%	72%	52%
Std Dev	13%	21%	21%	21%	16%	19%

**Table 6: Key Differences in Pairwise Comparisons**

Pairing	Outcomes Delta	Cost Control Delta	Sustainability Delta
1	0.19	(0.16)	0.15
2	0.07	0.07	0.17
3	0.54	0.23	0.47
4	0.16	0.18	0.36
5	0.27	0.14	0.38
6	0.02	(0.02)	0.07
7	0.24	(0.22)	(0.09)
8	0.02	(0.06)	0.14
9	0.18	0.18	0.20
10	0.18	0.71	0.48
11	0.24	(0.43)	(0.02)
12	0.17	0.02	0.08
13	0.04	0.24	0.23
14	0.01	0.22	0.23
15	0.15	(0.09)	0.21
16	0.17	0.06	0.17
Avg	0.17	0.07	0.20
Std Dev	0.13	0.25	0.16
Max	0.54	0.71	0.48
Min	0.01	(0.43)	(0.09)

**Table 7: Bivariate Correlations**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 DV1: Outcomes	-.*														
2 DV2: Cost Con	.017	-.*													
3 DV3: Sustain	.374	.090	-.*												
4 Intra	.146	.114	.392	-.*											
5 Hospital Size	.046	.108	.024	.013	-.*										
6 Hosp Age	(.113)	(.119)	(.153)	(.147)	.008	-.*									
7 Surg Spec	.037	(.111)	(.092)	.035	.094	(.066)	-.*								
8 Util Rate	.055	.173	.128	.096	(.117)	(.147)	(.031)	-.*							
9 Medicare %	(.052)	(.099)	(.014)	.021	(.093)	(.003)	.053	.002	-.*						
10 Medicaid %	(.152)	(.313)	(.211)	.002	.007	.027	(.003)	.085	.003	-.*					
11 Insured (%)	.149	.142	.135	.046	(.018)	.132	.172	.013	.018	.237	-.*				
12 Charity %	(.170)	(.156)	(.134)	.002	.017	(.089)	(.116)	.074	.110	(.142)	(.074)	-.*			
13 Prof Exper	.081	(.015)	.066	.001	.073	(.047)	.105	.002	.041	.009	.003	.001	-.*		
14 Turn Rate	.119	.098	.073	(.153)	(.003)	(.068)	(.007)	(.067)	.005	.097	(.090)	.174	.092	-.*	
15 Patient Load	(.338)	.165	(.226)	.007	.115	(.011)	(.091)	.218	.072	.120	(.118)	(.223)	(.004)	.070	-.*
16 Wages	.032	(.125)	(.030)	(.006)	.143	(.103)	.070	.133	.003	(.083)	.066	(.047)	.179	(.058)	.036

*Italicized correlations are significant at the 0.01 level (2-tailed).*

*Paratheses indicate inverse correlations.*

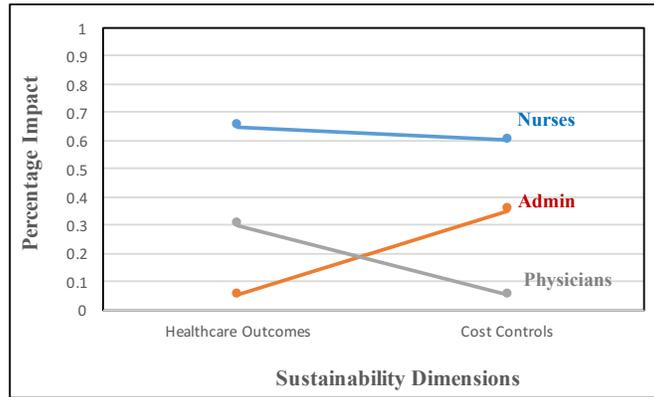
**Table 8: Regression Results**

	H1: Health Outcome Performance		H2: Cost Performance		H3: Sustainability Performance	
	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b
(Constant)	Incl	Incl	Incl	Incl	Incl	Incl
Intrapreneurship Program (1 = Yes)		7.27***		5.52***		7.38***
		2.81		1.74		4.06
Intra Program Duration (Years)		0.03		0.15*		0.06
		0.01		0.07		0.02
Intra Program Duration (Years) <sup>2</sup>		0.25**		0.08		0.21*
		0.11*		0.03		0.10
Hospital Size (Beds)	0.18**	0.13*	0.05	0.04	0.11*	0.08
	0.11	0.06	0.02	0.01	0.05	0.04
Hospital Size (Revenue - \$MM)	0.12*	0.10	0.07	0.05	0.08	0.08
	0.07	0.04	0.03	0.02	0.03	0.04
Hospital Age (Years)	-0.07	-0.07	-0.23**	-0.26**	-0.14*	-0.12*
	0.03	0.03	0.05	0.09	0.03	0.03
Hospital Surgical Specialties (#)	0.22**	0.17*	-0.26**	-0.21*	0.03	-0.05
	0.06	0.03	0.12	0.08	0.01	0.01
Time Since Last Major IT Upgrade (Years)	-0.25**	-0.15*	-0.31***	-0.25**	-0.28**	-0.24
	0.15	0.09	0.18	0.11	0.11	0.14
Mean Utilization Rate (%)	0.11*	0.11*	0.85***	0.67***	0.45***	0.33**
	0.07	0.05	0.34	0.25	0.20	0.13
Mean Annual Capital Expenditures (\$MM)	0.21**	0.16*	0.26**	0.18*	0.21**	0.22**
	0.12	0.08	0.12	0.08	0.12	0.10
Debt to Capitalization (%)	-0.05	-0.06	-0.15*	-0.16*	-0.11	-0.09
	0.03	0.03	0.04	0.05	0.03	0.03
Medicare Patients (%)	0.14*	0.18*	-0.11*	0.05	0.12*	0.10
	0.04	0.05	0.04	0.03	0.04	0.04
Medicaid Patients (%)	-0.54***	-0.19**	-0.75***	-0.46***	-0.72***	-0.43***
	0.33	0.10	0.44	0.19	0.36	0.14
Insured Patients (%)	0.71***	0.51***	0.32**	0.22**	0.53***	0.41***
	0.42	0.29	0.13	0.13	0.31	0.24
Charity as % of Total Expense	-0.37***	-0.18*	-0.54***	-0.39*	-0.47***	-0.29**
	0.21	0.11	0.16**	0.13	0.19	0.15
CEO Salary (\$)	-0.13*	0.04	-0.18*	-0.12*	-0.09	-0.04
	0.08	0.01	0.13	0.08	0.07	0.02
Nurses Mean Prof Experience (Years)	0.24**	0.11*	-0.27**	-0.09	0.14*	0.11*
	0.13	0.04	0.10	0.02	0.08	0.06
Turnover Rate	-0.04	0.02	-0.03	0.05	-0.04	0.01
	0.01	0.01	0.01	0.03	0.01	0.00
Turnover Rate <sup>2</sup>	0.15*	0.17*	-0.11	-0.07	0.12*	0.14*
	0.05	0.06	0.07	0.05	0.04	0.06
Patient Load	-1.53***	-0.45***	-1.26***	-0.43***	-1.64	-0.38***
	0.06	0.01	0.03	0.01	0.06	0.00
Nurses Mean Hourly Wage (\$/hr)	0.16*	0.05	-0.08	-0.07	0.07	0.10
	0.07	0.02	0.02	0.02	0.04	0.03
Nurses with B.S.-R.N. or Higher (%)	0.12*	0.07	0.11*	0.06	0.12*	0.12*
	0.03	0.02	0.04	0.02	0.03	0.04
Adjusted R <sup>2</sup>	0.623	0.817	0.544	0.632	0.592	0.781
Δ R <sup>2</sup> (vs. Controls)	-	0.194	-	0.088	-	0.189
F*-Value - Full Model	174.2	205.4	151.8	186.9	166.3	195.5

Non-Standardized Coefficients. Units are Mean-Centered and Expressed in Terms of Each Model's Dependent Variable.

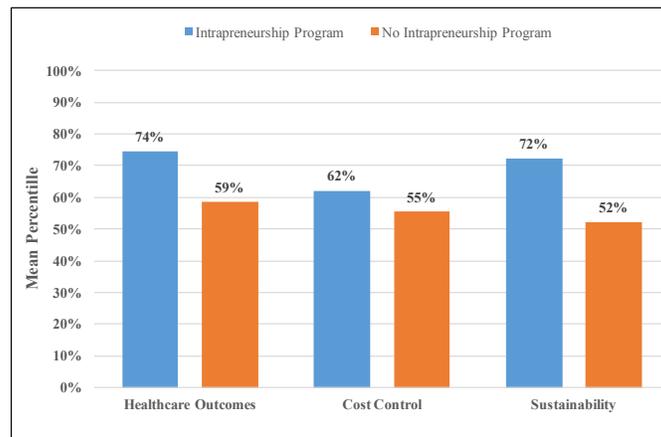
\*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$

**Figure 1: Meta-Analytic Results of Impacts on Sustainability Dimensions**



Adapted from Hunt and Ortiz-Hunt (2018)

**Figure 2: Mean Percentile Rankings Hospitals with and without Intrapreneurship**



**Figure 3: Matched Pair Sustainability Comparisons**

