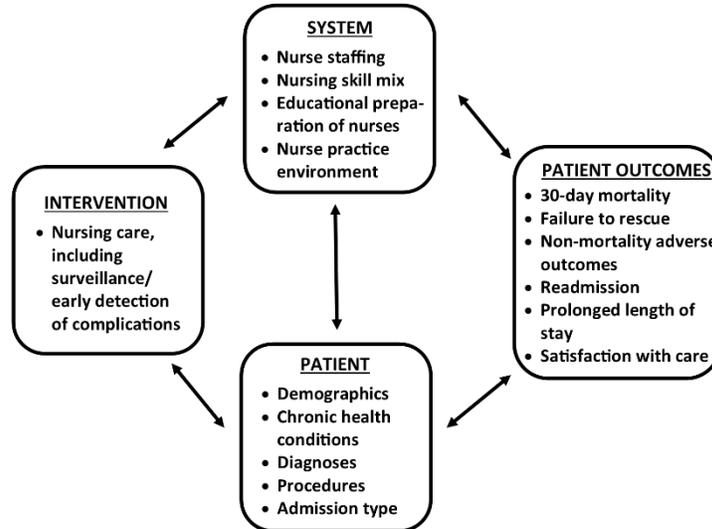## 1. Summary of project aims

The specific aims are:

Aim 1. To (a) collect data from random samples of nurses in a large representative sample of Chilean general acute hospitals of over 100 beds, both public and private, that collect DRG data, and (b) examine nurse staffing, skill mix, and work environment.

Aim 2. To determine the extent to which nurse staffing, nurse skill mix and the nurse work environment affect patient outcomes. The outcomes to be studied include mortality, failure to rescue, patient satisfaction, readmissions, length of stay, and other adverse outcomes as feasible to measure from the DRG data.

## 2. Theoretical/conceptual framework

The overarching conceptual framework that guides our work (Figure, below) is the Quality Health Outcomes Model (QHOM) developed by the American Academy of Nursing. This model is an elaboration and extension of Donabedian's (1966) essentially linear conception of quality that structure affects processes, which in turn affect outcomes. There is an assumption in Donabedian's framework that these three elements are directly related but this has been difficult to demonstrate empirically (Mitchell, Ferketich, & Jennings, 1998) (Mitchell & Shortell, 1997) (Flood & Scott, editors, 1987).  The QHOM incorporated the "structure-process-outcomes framework into a dynamic model that recognizes the feedback that occurs among clients, the system or context in which the care is provided, and interventions" (Mitchell, Ferketich, & Jennings, 1998). The Quality Health Outcomes Model further posits that the effects of interventions (intervention of nursing care is implicit in our proposed study) are mediated by client and system characteristics; no independent direct effect on outcomes is assumed (Flood & Scott, editors, 1987). We find conceptually that the relationships specified by the QHOM are consistent with observations that there are far more nursing and other interventions that have been shown to be successful under controlled conditions to improve patient outcomes but do not have their intended effects once introduced into real life practice. Our 25 years of research has amassed substantial evidence that modifiable "system" features such as patient to nurse staffing ratios, nursing workforce skill mix, the composition of the RN workforce by educational qualifications, and the quality of the work environment mediate the outcomes of nursing interventions such as in-hospital resuscitation (McHugh, Rochman, Sloane, Berg, Mancini, Nadkarni, et al., 2016); infection prevention (Cimiotti, Aiken, Sloane, & Wu, 2012); and the rescue of patients experiencing complications in the hospital (Aiken, Cimiotti, Sloane, Smith, Flynn, & Neff, 2011).

### Conceptual Framework Based on Quality Health Outcomes Model

**SYSTEM**
- Nurse staffing
- Nursing skill mix
- Educational prepa-ration of nurses
- Nurse practice environment

**INTERVENTION**
- Nursing care, including surveillance/ early detection of complications

**PATIENT OUTCOMES**
- 30-day mortality
- Failure to rescue
- Non-mortality adverse outcomes
- Readmission
- Prolonged length of stay
- Satisfaction with care

**PATIENT**
- Demographics
- Chronic health conditions
- Diagnoses
- Procedures
- Admission type

## 3. Methods, procedures and sampling

The Center for Health Outcomes and Policy Research at the University of Pennsylvania School of Nursing partnered with our Chilean colleagues, led by Universidad de los Andes, and including 3 other top Chilean nursing schools-- Pontificia Universidad de la Católica de Chile, Universidad de La Serena, and Universidad de Concepción-- to design, implement, and execute a research program that builds their research infrastructure, studies comparatively low-cost organizational leverage of nursing inputs to improve patient outcomes, achieves higher value for investments in nursing, and motivates decision-makers to implement research findings that hold promise making health care more effective, affordable, and satisfactory to the public.

The study utilized a cross-sectional design. Surveys were collected from 1,632 registered nurses and 2,017 patients across medical-surgical units in 40 adult general hospitals in Chile aggregated to the hospital level. The practice environment was measured through the Practice Environment Scale of the Nursing Work Index. Nurse job outcomes included burnout, job dissatisfaction, and intent to leave. Patient care experience measures included hospital rating, likelihood of recommending the hospital, satisfaction with nursing care, and satisfaction with pain control. Adjusted logistic regression models were used to test associations of the practice environment with nurse and patient outcomes.

## 4. Summary of findings

<u>Publications:</u> Results from this study have resulted in two publications and a dissertation (embargoed for two years) to date, with further manuscripts in preparation. These include:

a. Aiken, L.H., Cerón, C., Simonetti, M., Lake, E.T., Galiano, A., Garbarini, A., Soto, P., Bravo, D., Smith, H.L. 2018. Hospital Nurse Staffing and Patient Outcomes.  Rev. Med. Clin. Condes; 29(3) 322-327.

b. Simonetti, M., Aiken, L.H., Lake, E.T.  2018. Nursing in Chilean Hospitals: A Research Agenda to Inform Health Policies and Improve Patient Outcomes.  Hispanic Health Care 17(2), pp. 79-88.

c. Simonetti, M. (2019). Association between Nurse Work Environment, Nurse Job Outcomes, and Patient Experience in Chilean Hospitals. (Unpublished doctoral dissertation). University of Pennsylvania, Philadelphia, United State of America.

<u>Aim 1</u>.

<u>Staffing</u>. There is large variability RN to patient staffing.  Hospitals staffing ranges from 5.6 patients per RN to 20.2 patients per RN. Average staffing is 12.2 patients per RN.



Patient to RN Average Workloads by Hospital
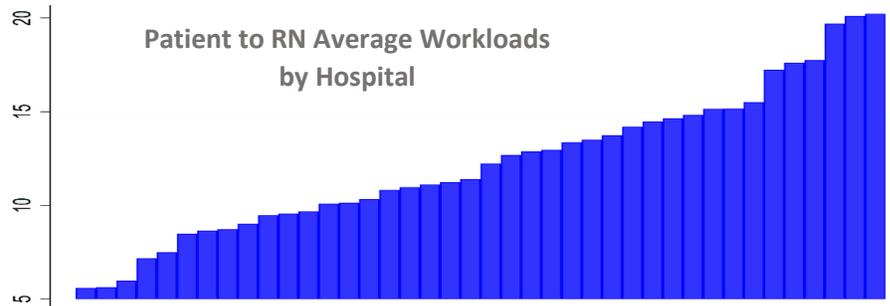
<u>Skill Mix</u>.

Skill mix (RNs as % of all direct care staff)

- 32% are RNs, which is very low compared to US and Europe
- 56% are technical nurses, which is comparatively high
- 12% aides



Skill Mix (% Nurses), by Hospital
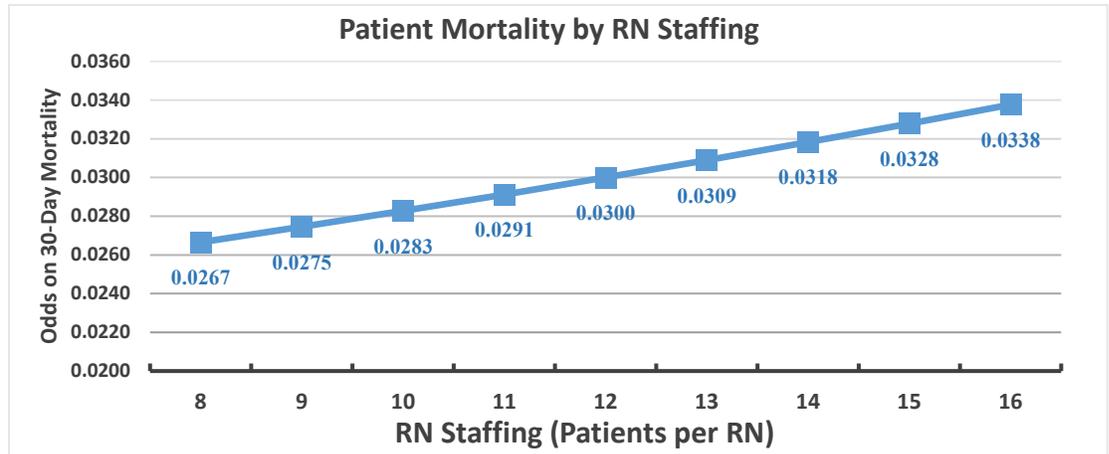Mean: 32%, Range: 19% - 50%
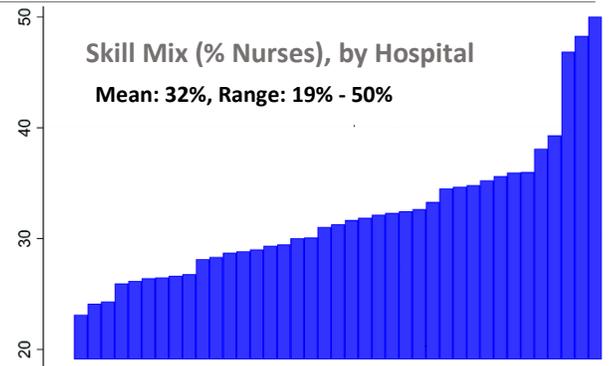
<u>Work environment</u>.

There were no significant differences in terms of type of ownership, hospital location, or bed size. Regarding nurse characteristics across the different practice environments, hospitals showed significant differences in nurses' age, years of experience, and sex. Hospitals with poor and good practice environments had younger nurses compared to hospitals with mixed; also, hospitals with poor practice environments had nurses with the least number of years of experience and with the highest proportion of male nurses.



% Rating Work Environment Poor or Fair, by Hospital
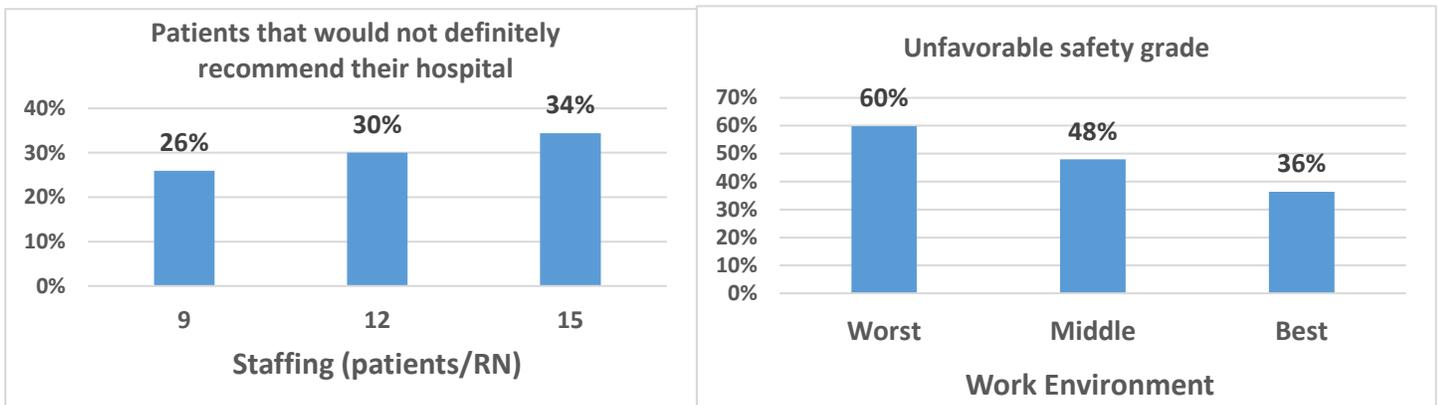Mean: 44%, Range: 8% - 71%
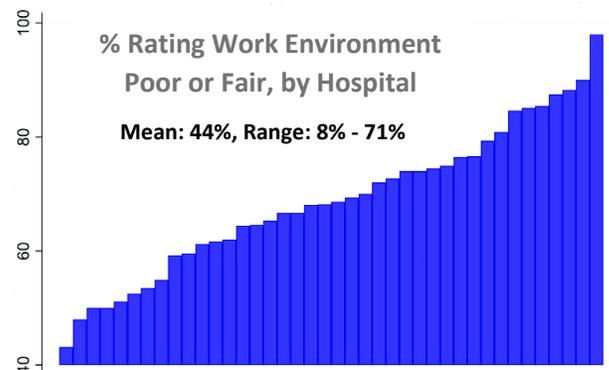
<u>Aim 2</u>.

<u>Mortality</u>.
RN staffing is strongly associated with 30-day mortality. For example, 30-day mortality in hospitals with 15 patients per RN is 19% higher than hospitals with 9 patients per RN.

**Patient Mortality by RN Staffing**

Odds on 30-Day Mortality vs RN Staffing (Patients per RN): 0.0267, 0.0275, 0.0283, 0.0291, 0.0300, 0.0309, 0.0318, 0.0328, 0.0338

<u>Patient satisfaction</u>.
Patient Satisfaction is lower in hospitals in which nurses care for more patients where RN staffing is worse, patients are less likely to recommend their hospital. Unfavorable patient safety grades are more likely in hospitals with poor nurse work environments.

**Patients that would not definitely recommend their hospital**
Staffing (patients/RN): 9 = 26%, 12 = 30%, 15 = 34%

**Unfavorable safety grade**
Work Environment: Worst = 60%, Middle = 48%, Best = 36%

## 5. Recommendations

Hospitals in Chile, both public and private, exhibit large variation in the quality of their nurse practice environments, larger than variations seen in other studies internationally. In addition, the nurse practice environment shows a significant association with patient experience in aspects of care that are related to nurses. RN4CAST-Chile finds greater investment in RN staffing is key to improve patient outcomes in Chilean Hospitals. Improving RN staffing is the highest priority to prevent hospital deaths.

The research team is currently working directly with the Ministry of Health and the National Commission on Productivity on the feasibility of the Ministry implementing minimum nurse to patient ratios in Chile.

<u>Literature Cited</u>

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