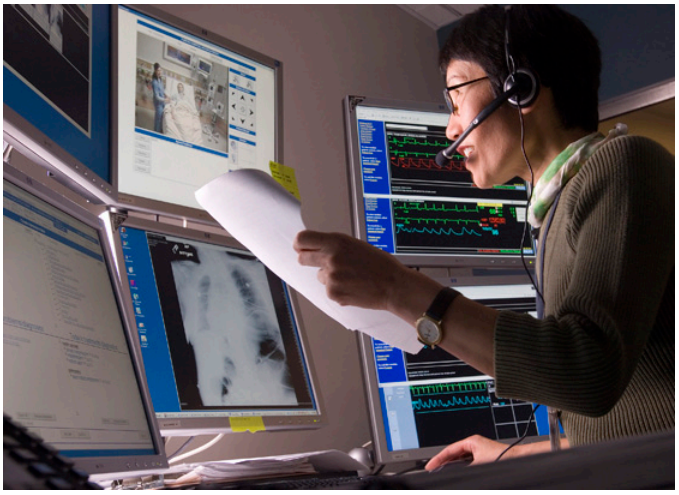
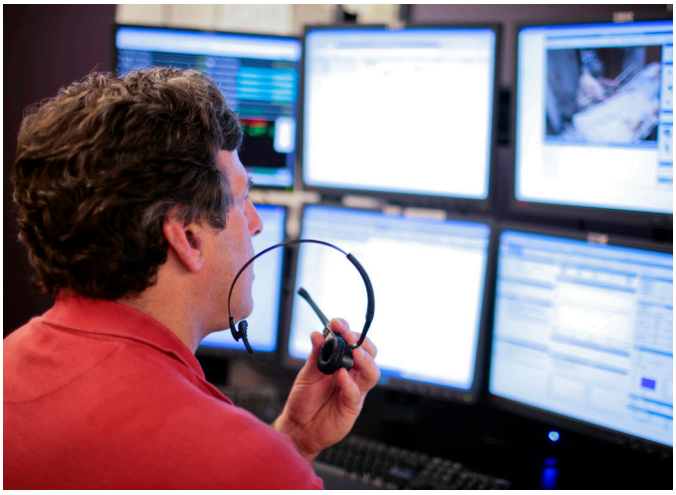
Planning for Tele- ICU in California

Phase 1 Environmental Scan





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NEHI is an independent, nonprofit national network focused on enabling innovation to improve health care quality and lower health care costs. In partnership with members from all across the health care system, NEHI conducts evidence-based research and stimulates policy change to improve the quality and the value of health care. Together with this unparalleled network of committed health care leaders, NEHI brings an objective, collaborative and fresh voice to health policy.
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Project Overview

Phase 1 of *Planning for Tele-ICUs in California* has two main objectives:

- To examine existing adult intensive care unit (ICU) utilization in California hospitals, identifying areas of unmet need for critical care and opportunities for improving ICU capacity, quality, efficiency and cost of ICU care; and
- To examine stakeholder perceptions of critical care in California, including challenges facing critical care, the potential role of tele-ICUs in addressing these challenges, other recommended solutions, the presence of tele-ICUs in California, and perceived benefits of and barriers to tele-ICU expansion.

Data to inform this environmental scan come from the Office of Statewide Health Planning & Development (OSHPD), The Leapfrog Group, the Dartmouth Atlas of Health Care, and input from 36 California hospital executives and state and national critical care and tele-ICU technology experts. Twenty-eight in-depth interviews were completed, and a group discussion was held with eight chief medical executives from the California Hospital Association's Center for Hospital Medical Executives.

This report highlights key findings from the research and ends with a set of recommendations for Phase 2 of *Planning for Tele-ICUs in California*.

Tele-ICU Technology: Background

The Intensive Care Dilemma

Intensive care units (ICUs) are a vitally important component of health care in the U.S., providing treatment for six million of the sickest and oldest patients in the country every year. The choices about how to manage ICUs carry high stakes: ICUs have both the highest mortality (10-20 percent in most hospitals) and the highest costs in health care, accounting for 4.1 percent of the nation's $2.6 trillion in annual health care spending, or nearly $107 billion per year. Adding to the complexity of ICU management decisions is the collision of two major trends: the increasing number and severity of critical care patients as the U.S. population ages, and the decreasing supply of critical care physicians (intensivists) available to manage this growing number of ICU patients.

The Leapfrog Group is one of the leading national associations of health care purchasers and employers focused on health care quality, safety and value. Leapfrog's hospital quality ratings call for full-time intensivist staffing as a way to reduce ICU deaths by an estimated 50,000 lives per year. However, in 2006 there were reported to be fewer than 6,000 actively practicing intensivists in the U.S. and fewer than 20 percent of ICUs were staffed with intensivists. As the American population ages over the next few decades, the demand for critical care and ICU services is projected to rise substantially. At present, there is a need for four times as many full-time intensivists than are currently practicing to provide around-the-clock staffing at more than 7,000 ICUs nationwide. This shortage will only grow more acute and is compounded by the fact that not all hospitals are successful at recruiting intensivists. The combination of financial constraints, other care settings (such as the Emergency Department) drawing critical care physicians away from the ICU setting, and a shortage of intensivists presents major obstacles to achieving recommended levels of intensivist staffing in the nation's hospitals.

A 2007 California HealthCare Foundation report by Kurt Salmon Associates (KSA), *Rethinking the Use of Intensive Care Beds in California Hospitals*, used Dartmouth Atlas and California hospital utilization data to examine critical care use in California. Salmon Associates found a higher than national average ICU utilization for patients at the end of life; no correlation between ICU case mix and utilization; a wide degree of variation in ICU average length of stay (ALOS) among California hospitals that could not be explained by variation in severity of patient illness (30 percent of California hospitals had excessive ICU lengths of stay relative to their ICU case mix score); and regions of very high ICU utilization including Los Angeles and Orange County. *Rethinking the Use of ICU Beds in California Hospitals* concluded that efforts to reduce variation in ICU utilization and improve the use of existing ICU beds could increase ICU capacity in markets with high utilization, make better use of scarce nursing resources and reduce costs. The report concluded with the recommendation that remote intensivist monitoring through tele-ICUs is a "quality-driven initiative" that could result in ICU utilization savings.

Tele-ICU Technology: A Possible Solution

Tele-ICUs, a telemedicine technology, have the potential to address the critical care staffing shortage by putting intensivists and other specialists in a central "command center" to remotely monitor, consult to, and care for ICU patients in multiple and distant locations. As of 2010, approximately 250 hospitals had implemented a tele-ICU program in the U.S. (including 42 tele-ICU command centers) representing 7.6 percent of U.S. hospitals with adult ICU beds or 6.8 percent of adult ICU beds. "Tele-intensivists" are critical care physicians who practice medicine via interactive audio-visual equipment, using computers to track data trends and access best-practice protocols for patient care. One tele-ICU command center can provide care for up to 500 patients, with staffing constellations of one tele-intensivist, four

advanced practice nurses and a pharmacist to care for 75 patients. Satellite hospitals can wire a few ICU beds or many ICU beds for tele-ICU technology depending on need. For example, in rural areas, experts recommend wiring a few ICU beds in a hospital that can serve a large geographic region. By increasing the number of ICU patients that critical care teams can manage, tele-ICU technology can effectively extend both the productivity and the reach of intensivists, other critical care specialists and nursing staff.

Barriers to Tele-ICU Adoption

Although tele-ICU technology holds promise to expand ICU capacity and solve the mismatch between the supply and demand for intensivists, several barriers have contributed to its slow adoption nationally. In addition to physician resistance and technical compatibility issues, there is an initial capital cost that can be daunting to a hospital and in addition, competition for IT project financing within hospitals can be a further challenge. Other barriers to tele-ICU adoption include regulations regarding cross-institution and cross-state physician licensing and credentialing, and also lack of Medicare reimbursement for telehealth services. To date, there has been a lack of documented clinical and financial outcomes of the benefits of tele-ICU care in published literature and therefore a subsequent lack of awareness of and belief in the technology's potential for improving critical care access, quality and cost reduction.

A Rapid Demonstration Project in Massachusetts

A pre and post tele-ICU coverage study conducted by NEHI and the Massachusetts Technology Collaborative between 2008-2010 aimed to test the clinical and financial benefits of tele-ICU technology on two important outcomes: ICU mortality and ICU length of stay. Data for this study were collected from three sites in Massachusetts: an academic medical center with seven adult ICUs (University of Massachusetts Memorial Medical Center, referred to as UMMMC) and two community hospitals. Results are summarized in the 2010 report, *Critical Care, Critical Choices: The Case for Tele-ICUs in Intensive Care* (attached as Appendix 1). At this time, the manuscript of this study is undergoing peer review for publication.

Key results of this demonstration included:

- *Significant declines in ICU mortality were observed in two of the three hospitals.*
    - There was a 20 percent decline in ICU mortality at UMMMC at the same time that the APACHE III scores increased by 13 points; and
    - There was a 36 percent decline (after severity adjustment) at one of the two community hospitals.
- *There was an increase in mortality at the second community hospital.* In the pre-implementation period, this hospital had an abnormally low ICU mortality rate of 2.1 percent, as it transferred most of its critically ill patients to UMMMC. After implementation of tele-ICUs, it retained 23 percent more of the acute patients that presented to the Emergency Department and its mortality rate rose to a more average 7.3 percent.
- *The patient length of stay in the ICU decreased.* There was a 30 percent shorter average length of stay at UMMMC, and 16 percent and 42 percent decreases in ICU LOS at the two community hospitals.
- *There was a rapid payback period for the financial investments of participating hospitals.* The up-front investments of $7.1M at UMMMC and $400,000 at each community hospital were paid back in full within one year. Hospitals realized a significant return on their investment.

- *Tele-ICUs resulted in financial benefit to payers.* Patients treated in community hospitals using tele-ICUs were less expensive ($10,000 less per patient) than the same patients treated in the academic medical center ICUs. In addition, the average cost per case in the academic medical center was reduced by $2,600.
- *There were fewer patient complications with tele-ICU care.* There were significant decreases in hospital-acquired infections associated with the use of ventilators and central lines in the ICU.

Other Tele-ICU Research and Information

A February 2011 article in *Becker's Hospital Review* also noted the benefits of tele-ICUs. Derived from an expert interview, this article highlights ways tele-ICU technology has been shown to help hospitals save money, improve outcomes, improve physician relationships and provide more efficient patient care. The article summarizes feedback from an interview with Mary Jo Gorman, MD, a leading tele-ICU expert and CEO of Advanced ICU Care, a St. Louis-based company that brings board-certified intensivists to hospital ICUs through tele-ICU technology. Tele-ICU benefits highlighted in the article support many of NEHI's research findings in Massachusetts and are summarized below.

- *Tele-ICUs reduce patient mortality, complications and costs.* Gorman reports that hospitals that adopt tele-ICU technology typically see a 40 percent reduction in mortality and 25 percent reduction in ICU length of stay. Decrease in length of stay also reduces complications and lowers the cost of ICU care.
- *Tele-ICUs increase ICU patient volume and allow better patient retention by community hospitals.* A tele-ICU program allows hospitals to retain as many ICU patients in the community as possible. Community hospitals that adopt tele-ICU technology and the 24/7 intensivist support provided, typically see a 17 percent patient volume growth in the ICU.
- *Tele-ICUs improve physician recruitment capabilities.* Continuous monitoring by intensivists (made possible through tele-ICUs) reduces the need for physicians in community hospitals to respond to emergency calls at all hours, improves physician work-life balance and increases satisfaction.
- *Tele-ICUs free up resources and physicians for coordinated care.* With health reform and the emergence of Accountable Care Organizations (ACOs), hospitals are shifting their focus to the continuum of care, improved quality and lower costs. Tele-ICUs allow hospitals to better deploy physician resources in the community which better enables ACOs to meet new Medicare ACO performance goals.
- *Unlike most healthcare affiliations or partnerships, tele-ICU programs are not limited by geographic restrictions.*

Other relevant ongoing national research includes a project funded by the Health Resources and Services Administration (HRSA), *Analysis and Evaluation of Electronic Intensive Care Services that Are Being Utilized in Rural Areas* project, conducted by Walter R. McDonald & Associates. In funding this research, HRSA recognized that one of the greatest potential benefits of tele-ICUs may be the prospect of providing more advanced care in rural areas. The findings and recommendations of this evaluation of three rural tele-ICU programs will provide HRSA and the field with useful information regarding the effectiveness, benefits and barriers to using tele-ICUs to provide high quality health care services in rural areas.

Another current research project is the American Association of Critical Care Nurses (AACN) study to examine the impact of tele-ICUs on ICU nursing care. This study will also inform the development of

guidelines for critical care nursing on the adoption, staffing and deployment of tele-ICU technology by hospitals. The study is a collaboration among investigators at Rush University Medical Center, Baptist Health South Florida, Resurrection Health Care, the University of Massachusetts Memorial Medical Center (UMMMC) and Eastern Maine Medical Center.

In addition, a few health systems are seeing added benefits from tele-ICU adoption even in circumstances where they have sufficient intensivist staffing. A good example of this comes from Maine Medical Center, a 600-bed academic medical center with a strong critical care program. They have had 24-hour attending-level, critical care intensivist coverage since 1995. Maine Medical installed tele-ICU care in 2005 in medical, surgical and neurological ICUs and measured the changes in mortality for seven weeks prior to and seven weeks after tele-ICU implementation. Even with full intensivist coverage, Maine Medical achieved a 20 percent reduction in mortality with tele-ICU care, primarily due to increased patient monitoring and earlier clinical interventions that prevented complications and adverse events.

Tele-ICUs in California

At this time, tele-ICU technology is not in widespread use in California. Twenty-eight hospitals with about six percent of California ICU beds currently have tele-ICU capability (which is roughly equivalent to the national average). Sutter Health and John Muir Health are the only systems in California currently operating tele-ICU command centers. Both systems have installed the VISICU tele-ICUs (trade name "eICU"). VISICU pioneered the tele-ICU technology and it was purchased in 2008 by Philips Electronics North American Corporation. Philips VISICU remains the leading tele-ICU vendor with approximately 85 percent of market share. The following section summarizes information gathered from interviews with representatives from Sutter Health and John Muir Health. It describes their experiences with tele-ICU implementation, how these systems are currently used in their hospitals, and the challenges and benefits of tele-ICUs that have been realized at each system. Appendix 2 shows the Sutter Health and John Muir tele-ICU networks.

Sutter Health

The first health system to adopt tele-ICU technology in California, Sutter Health operates two command centers (one in Sacramento and another in San Francisco) with 26 satellite hospitals, including three non-Sutter affiliates. Sutter has had good overall experience with tele-ICUs since 2003, but it took several years to fully implement across all 26 satellite locations. According to interviewees from Sutter, tele-ICUs are working well in most satellite locations, but at a few sites it has been met with "ambivalence," and in some sites, the lack of connectivity of tele-ICUs to other hospital electronic records has meant delays in ICU treatments and increased burdens on the nursing staff. Sutter representatives noted that tele-ICU technology "competes" with other technologies at Sutter – most notably, that the two EMRs in place (EPIC and VISICU) are not interoperable. Satellites must enter local ICU data into eCare Manager in order for the command center to receive the data. Most satellites do this, but some do not. If they do not, medical records must be faxed to and from satellites before the satellite ICU data can be entered into the tele-ICU system at the command center.

Lessons learned from Sutter's tele-ICU implementation are that, in some satellite locations, human factors were more important than the technology in determining success, and that getting physicians on board with the technology has been key. At some satellite locations, ICU physicians were initially resistant and felt threatened that the new technology would take away their autonomy and decrease their patient visit charges. Once tele-ICUs were implemented, physicians found that this was not the case. Physicians in satellite locations found that tele-ICUs reduced the amount of time they needed to be on call, especially overnight. Sutter reports a bi-modal distribution of physician satisfaction with tele-ICUs: physicians either appreciate the expert intensivist consultation or they dislike what they perceive as a loss of independence. In summary, Sutter has learned that: "Tele-ICUs are great, but only as good as its link to the satellite EMR," and "Technology enables, but human factors are more important than the technology."

The impact and benefits of this technology are very solid at Sutter in locations where these challenges have been successfully addressed. Sutter reports reduced ICU ALOS associated with tele-ICUs, and financial analyses performed at both the Sacramento and San Francisco hubs have demonstrated positive returns. Sutter also noted that as early adopters of this technology, it broke new ground in addressing these and other technical challenges and have developed workable solutions at most sites.

Sutter is very interested in expanding its tele-ICU program to additional ICUs where there is medical need, clinical buy-in and sufficient financial support to defray costs. Sutter reports that it is likely that existing capacity can be deployed or readily expanded to handle "a large number of additional beds." Experts outside of Sutter noted that Sutter's tele-ICU service is currently priced too high to stimulate more uptake by non-Sutter ICU locations. Experts pointed to product price, other health system competition with Sutter, and a lack of awareness of the potential benefit of tele-ICUs in the marketplace as the primary reasons why Sutter's tele-ICU service has not grown further. At this time, Sutter is exploring other applications for the tele-ICU network, including tele-hospitalists and specialty tele-consultation.

John Muir Health

John Muir Health (JM) has operated the VISICU (eICU) system at two California sites since 2006 - in Concord and in Walnut Creek. JM has 12 board certified intensivists at these sites. JM's Vice President of Quality and Patient Safety reported that the first year of tele-ICU implementation was challenging on three fronts: getting physicians aligned to use the new system, prioritizing tele-ICU implementation among other IT needs, and financing the cost of the system ($4M at JM). After "a tough first year," JM is now very pleased with the results of the tele-ICU system. JM reports physicians and nurses are willing to use the system and report high satisfaction with tele-ICUs. Since 2008, JM has seen a 36 percent reduction in mortality at Concord and an 18 percent reduction at Walnut Creek. ICU length of stay has declined 31 percent at Concord and 16 percent at Walnut Creek. In addition, the number of cardiac arrests has declined by 31 percent, sepsis mortality has decreased, and ICU bundle compliance for ventilator and central line use has increased with e-ICU. Similar to the experience of Maine Medical, JM notes that these improvements were realized with 12 intensivists already covering JM ICUs. JM also reports a positive return on tele-ICU investment. A complete summary of JM tele-ICU outcomes was provided by JM, and is attached as Appendix 3.

JM's strategy for tele-ICU implementation has been "to get it right first at JM, then expand beyond JM to new satellite locations." JM has successfully implemented tele-ICUs at two JM sites. They have also deployed the technology beyond the ICU to connect emergency and neurology departments to the intensivist hubs. In 2011, JM is preparing to expand its tele-ICU network to sites outside of the JM network. JM's "tier one" targets for expansion include hospitals that are located within the same region of the state (but not neighboring hospitals); hospitals that have a similar IT platform as JM; hospitals that do not have board certified intensivists on staff; hospitals that have room for improvement in ICU length of stay and outcomes; and hospitals that are financially solvent and able to afford a tele-ICU satellite solution. JM will begin marketing its tele-CU services to potential ICU satellites over the next few months.

Examination of Statewide Critical Care Utilization and Capacity

In Phase 1 of *Planning for Tele-ICUs in California*, we examined California ICU supply and utilization to identify regions of the state where additional ICU capacity may be warranted. In regions where more ICU capacity is needed, tele-ICU technology could be implemented to improve ICU capacity and address unmet need. This section of the report summarizes findings from the following data sources: 2009 Annual Utilization Report of Hospitals Database from OSHPD, the 2009 Dartmouth Atlas, and ratings of hospitals' intensivist staffing reported by The Leapfrog Group. Key observations from these data are summarized below.

California hospital utilization data from OSHPD were used to examine adult ICU use and capacity statewide (OSHPD captures ICU and cardiac care unit beds combined, and they are referred to in this study as "ICU" beds). All California hospitals with six or more ICU beds were examined on the following variables: number of ICU beds, number of bed days, number of ICU discharges, number of ICU transfers, number of patient census days, ICU average length of stay (ALOS), ICU occupancy rate, and whether the hospital is located in a predominantly rural or urban area. ICU data were sorted by county, by county groupings (according to the map attached as Appendix 4) and by health system. All leading health systems operating in California were included in the analysis: Kaiser, Catholic Healthcare West, Sutter Health, Adventist Health System, HCA, Tenet, University of California, Scripps, Sharp Health System, University of Southern California and Providence Health and Services. There was also a large "other/non-affiliated" category of hospitals. California hospital ICU data are summarized in Appendix 5A and 5B: Appendix 5A presents the data sorted by county, and Appendix 5B presents the data sorted by health system.

OSHPD data reveals there are 293 hospitals in California with six or more ICU beds. These 293 hospitals have a total of 7,091 ICU beds, over 2.5 million bed days, an average ICU occupancy rate of 64 percent, an ALOS of 3.7 days, and a maximum observed ALOS of 18.9 days.

Examination of ICU supply and utilization revealed two categories of need for greater critical care capacity:

- *Category 1: Rural hospitals/regions*. Rural hospitals with ICUs having six or more beds are shaded green in Appendices 5A and 5B. Data on the supply and distribution of ICUs in California suggest that there are regions of the state that have unmet need for and limited access to critical care. For example, some areas of the state (like the Eastern Sierra counties of Inyo, Mono and Alpine) have no hospitals in the region with six or more ICU beds. In this study, California hospital executives reinforced the finding that there are portions of the state that lack critical care access and expertise. While further research is needed to gain a deeper understanding of critical care needs, referral patterns and existing services in these regions, it is likely that one or more of these remote areas could benefit from small-scale tele-ICU installations to provide critical care services to rural counties. Hospital systems with the largest rural presence include Sutter Health, Catholic Healthcare West and Adventist Health.
- *Category 2: Hospital ICUs that are at 85 to 100 percent capacity on average – these are hospitals with "capacity pain."* Data on California ICU utilization suggests there are regions with high ICU utilization and higher than average ICU length of stay. There are also areas of excessive utilization and/or poorly managed ICU care (similar results were shown by KSA in their 2007

analysis of California ICU utilization). These ICUs with the highest utilization are highlighted in red in Appendices 5A and 5B. Variation in ALOS among high capacity ("red") ICUs is shown in Appendix 6: Variation in ICU Average Length of Stay (ALOS) in Target Regions. Appendix 6 shows this group of hospitals also has a higher median ALOS and greater variation in ALOS compared to other hospitals in target regions. These hospitals present opportunities for reducing ICU length of stay, increasing ICU capacity and lowering the cost of ICU care.

Dartmouth Atlas data were used to determine the number of critical care physicians in regions of California. The 2009 Dartmouth Atlas reports the number of critical care physicians per 100,000 residents in Hospital Referral Regions in California in 2006 (presented in Appendix 5C). The Dartmouth Atlas defines Hospital Referral Regions (HRR) as regional market areas for tertiary medical care. Each HRR contains at least one hospital that performs major cardiovascular procedures and neurosurgery. (Note that HRR is not necessarily a county-based definition.) Examination of the number of critical care physicians in California reveals a very short supply overall and some areas of severe shortage. For example, the 2009 Dartmouth Atlas reports that there are 2.0 critical care physicians per 100,000 population in San Francisco, 1.2 critical care physicians per 100,000 residents in Los Angeles, and only 0.6 critical care physicians per 100,000 residents in Stockton. California hospital executives report that shortages of intensivists are particularly acute in California among small, rural hospitals. These findings highlight the need for new approaches to enable limited critical care resources to be leveraged through technology.

In addition, we examined the Leapfrog ratings of intensivist staffing for each hospital, along with whether the hospital currently has tele-ICU services in place. Both variables are included in Appendix 5A and 5B. These data reveal that 58 hospitals (less than 20 percent of California ICUs) report levels of intensivist staffing that fully meet the Leapfrog standard for intensivist staffing in the ICU.

Our analysis of California ICU supply, capacity, ALOS, variation in ALOS and supply of critical care physicians points to regions of the state with limited access to critical care (primarily rural areas) and regions where there are opportunities for improving ICU capacity through delivering more efficient and appropriate ICU care. The following geographic regions represent potential targets for tele-ICU technology to expand critical care access, capacity, efficiency and quality:

- Los Angeles County;
- San Bernardino County;
- Riverside County;
- Central Valley counties including San Joaquin, Stanislaus, Merced, Fresno, Kings, Tulare and Kern Counties; and
- The rural Eastern Sierra region: Inyo, Mono and Alpine Counties.

Feedback from experts and interviews with hospital executives confirmed these findings and also identified specific hospital system targets for tele-ICU adoption.

As noted above, ICUs with the highest utilization are highlighted in red in Appendices 5A and 5B. This group of hospitals also has a higher median ALOS and greater variation in ALOS compared to other hospitals in target regions. Appendix 6 summarizes the median ICU ALOS and the range and variation in ICU ALOS among two groups of hospitals: hospitals running at chronically high ICU capacity (85 percent or greater, "red" hospitals) and hospitals at 50-84 percent capacity ("blue" hospitals). Appendix 6 shows significantly greater variation in ALOS among hospitals with the highest rates of ICU capacity

("red" hospitals) compared to ICUs operating at 50-84 percent capacity ("blue" hospitals). Appendix 6 illustrates that the greatest variation in ALOS among "red" hospitals occurs in San Bernadino, Riverside and Los Angeles Counties.

In these regions with consistently high-occupancy ICUs, the observed variation in ICU ALOS may signal overuse or inappropriate use of ICUs and inefficient ICU patient throughput. ICU throughput can be stalled for many reasons, such as when patients who medically do not need to be in the ICU are cared for in the ICU, when patients remain in the ICU longer than needed because the physician wants them to be observed more closely or to have more skilled nursing care than they might get on a patient floor, or when payers are willing to cover the cost of additional ICU care. In the 2007 CHCF study of California ICU utilization, KSA found a wide degree of variation in ICU ALOS among California hospitals that could not be explained by variation in severity of patient illness (30 percent of California hospitals had excessive ICU lengths of stay relative to their ICU case mix score). They also found geographic regions with very high ICU utilization, including Los Angeles and Orange Counties. Tele-ICU technology may help high occupancy ICUs improve throughput, reduce length of stay, lower costs, and ultimately increase their ICU capacity and revenue.

Summary of Key Findings and Recommendations

This analysis of California ICU data, together with input from 36 hospital executives and state and national critical care and tele-ICU experts (see Appendix 7 for a list of Phase I Contributors), has been instrumental in shaping the following set of findings and recommendations:

Finding: Critical care in California hospitals faces significant challenges

Hospital executives identified the following most important challenges facing critical care in California:

- There is an insufficient supply of intensivists and critical care nurses;
- There is insufficient access to critical care in rural areas; and
- In some areas, ICUs beds are used inappropriately, resulting in strained ICU bed capacity.

These factors contribute to less than optimal ICU care management and, in some cases, longer than necessary ICU lengths of stay and higher costs of ICU care. Patient outcomes (mortality and complication rates) are also likely to be affected by these issues.

Recommendation: Increasing intensivist coverage and ICU capacity through expansion of tele-ICU networks to target California hospitals and systems could help address these challenges in the following ways:

- Tele-ICU technology is an intervention that has been shown to leverage critical care intensivist and nurse staffing to areas where there is an insufficient supply of critical care professionals and unmet needs for critical care;
- Intensivist consultation through tele-ICUs can be beneficial in training and mentoring nurses and physicians in satellite hospitals who are less experienced or new to the field of critical care; and
- Intensivist consultation through tele-ICUs has been shown to support appropriate ICU processes of care and patient admission to the unit. It also has been shown to reduce ICU length of stay and improve patient throughput. Together these outcomes could result in improved ICU capacity and better managed ICU care in regions with higher ICU utilization and need for expanded critical care capacity.

Finding: There are many tele-ICU expansion opportunities in California

There are two ways to examine opportunity and targets for tele-ICU expansion: by geographic region and by health system. Regional analyses of California hospital ICU data suggest regions with unmet needs for critical care where ICU capacity could be improved. These are primarily:

- Rural areas with little or no access to critical care specialists; and
- Urban centers where the majority of ICUs operate at 85-100 percent occupancy and show wide variation in ALOS (suggesting there might be potential for improving ICU throughput and efficiency).

These areas represent excellent potential targets for improving critical care capacity, access, quality and cost through tele-ICU expansion.

Geographic Areas
Our research suggests it would be beneficial to further explore and build the case for tele-ICU adoption in the following geographic regions of California in Phase 2:

- Los Angeles County;
- San Bernadino County;
- Riverside County;
- Central Valley counties including San Joaquin, Stanislaus, Merced, Fresno, Kings, Tulare and Kern Counties; and
- The Eastern Sierra: Inyo, Mono and Alpine Counties.

Health Systems
Tele-ICU command centers can typically manage 500 ICU beds in a tele-ICU network. Regions with unmet needs for critical care could be served by health systems interested in operating tele-ICU care in California.

Recommendations:

- One recommended strategy for expanding critical care capacity is to expand the Sutter Health and John Muir Health tele-ICU networks by increasing the number of satellites monitored by each command center. This option is feasible because both Sutter and JM have excess capacity in their command centers and are eager to grow their tele-ICU services.
- Other systems recommended for filling gaps in critical care through tele-ICUs include the UC System, Kaiser, Adventist Health, and Catholic Healthcare West. Most of these systems could potentially support a tele-ICU command center. Several health system representatives indicated that their networks may include potential tele-ICU satellite locations (these included Adventist Health and Catholic Healthcare West). Executives also recommended a few small, rural hospitals as potential tele-ICU satellite locations.
- Experts also provided information on the recommended profiles of the ideal tele-ICU command center and ideal satellite locations.
    - Recommended characteristics of the ideal tele-ICU command center are:
        - "An urban hospital with lots of intensivists";
        - "Hospitals must have capital and visionary leadership. They must be able to think outside of the box and have solid IT support"; and
        - "Hospitals with the ability to implement standards of care, with good infection prevention oversight, and with room for added capacity in the ICU."
    - Recommended profiles of the ideal tele-ICU satellite location are:
        - Midsize community hospitals (150-400 beds) with high patient acuity;
        - ICUs with "capacity pain" – 85 percent capacity or greater;
        - Hospitals and ERs with a high rate of transfer to higher acuity ICU settings; and
        - Hospitals with some intensivist coverage available, but not 24/7 intensivist coverage.

Finding: Perceptions on the future of tele-ICU technology in California and other approaches to critical care

Most experts that we interviewed believe that the use of tele-ICU technology will expand in California over the next five years. Stakeholders believe that telemedicine-supported ICU care will expand in a number of different ways.

- Through the growth of stand-alone, continuous monitoring tele-ICU systems like the Philips VISICU eICU.
- Through the expansion of hospital-wide e-record systems that possess a specialized EMR with audio-visual monitoring capabilities for ICU, such as the EPIC Level 7 EMR (EPIC's capabilities include remote monitoring of patients' vital signs and treatment status; remote visual monitoring of patients with a camera directed remotely for close-up consultation; and remote communication with in-ICU clinical staff to direct care).
- Through robotic telemedicine and smaller-scale tele-ICU installations (tele-ICU carts or wiring a limited number of ICU beds) to support ICU care in small, rural community and critical-access hospitals. For example, in rural areas, experts suggest that wiring a few ICU beds for tele-ICUs will provide sufficient intensivist coverage for a region. Similarly, in the North Coast region of California (including several Adventist Health hospitals), successful deployment of the OffsiteCare Solution is providing intensivist and specialty care consultation successfully aided through robotic telemedicine.
- Through expanding the use of hospitalists with immediate access to intensivist consultation (through tele-ICUs, robotic telemedicine or other telehealth technologies) to staff ICUs. ICU staffing by hospitalists is now occurring at UCSF and Sutter Health.

Recommendations:

- A comparative assessment of the available evidence and best use applications of tele-ICUs and several of these "less than full blown tele-ICU" alternative approaches could help providers examine and address specific needs for tele-intensivist support. Various versions of tele-ICU technologies could be examined to develop guidelines for determining when tele-ICUs are the best solution versus in what circumstances other tele-intervention alternatives are best suited or more cost effective for expanding intensivist coverage and critical care capacity.
- With this recent growth in use of hospitalists in the ICU, the question of how much connectivity to intensivists is enough to provide good quality ICU care with hospitalist staffing needs to be answered. Experts believe there is little or no empirical data available to answer this question of "how much connectivity is enough?" A study to compare outcomes for a hospitalist-staffed ICU with varying levels and kinds of e-connectivity to intensivists could be of benefit to the field and could further support regional planning to address critical care shortages in California.

Finding: Key factors determining the success of tele-ICU adoption

We identified the following key determinants of successful tele-ICU adoption in California:

- Experts believe that the most important determinants of tele-ICU success are human factors. Physicians and nurses must accept and embrace the use of tele-ICU technology, particularly in satellite locations. There need to be good, collaborative working relationships among providers in satellites and the command center.
- Effective communications about the core element of "shared decision-making" between command center and satellite hospital physicians can also improve successful adoption of tele-ICU. For example, physicians in satellite locations may be more receptive to working with a tele-ICU "support center" as opposed to a tele-ICU "command center."

- Interoperability is necessary for efficient, safe, optimal use of tele-ICUs. Current tele-ICU users in California underscored this point.
- Clarity about return-on-investment (ROI) analyses is critical for tele-ICUs to succeed. NEHI's Massachusetts demonstration revealed significant cost savings to hospitals and payers resulting from tele-ICU implementation, even in a hospital where the local physicians were unsupportive of the technology. The support center at UMMMC saved $20.4M in one year of tele-ICU operation, and the two community hospitals together saved $2.6M. In California, executives believe that the financial benefits of tele-ICUs would be strong for some hospitals (they expect vertically integrated systems like Kaiser to benefit), whereas for other hospitals there might not be any savings (the benefit would accrue to payers).

Recommendations:

- Executive feedback suggests that hospitals considering tele-ICUs will need to answer key questions before proceeding with tele-ICU adoption or expansion. These include:
    - Will tele-ICU adoption improve our ICU outcomes and quality of care?
    - Will tele-ICU adoption bring increased ICU market share to my hospital/system?
    - If we incur the cost of tele-ICU adoption, will revenue from reduced ICU length of stay and increased ICU market share result in a positive ROI?
    - In the case of each of the 30 federally designated Critical Access Hospitals in California, will tele-ICU adoption and the resulting expansion of ICU services, adversely impact this designation and their cost-based reimbursement rate?
- A synthesis of guidelines for successful tele-ICU adoption could be developed and disseminated in California. These guidelines could help California providers assess, successfully implement and effectively expand critical care capacity through adoption of tele-ICU technology.

Finding: Timely policy developments can support tele-ICU expansion in California

Summarized below are policy developments underway at the federal and state levels that will support efforts to plan for and operate tele-ICU technology in California. Some are developments that will result in policy, reimbursement or workforce changes that, once in place, will pave the way for effective tele-ICU adoption. Other policy developments are timed to support the recommendations proposed for Phase 2 of *Planning for Tele-ICUs in California*.

Key policy developments are summarized below, followed by recommendations for policy actions in Phase 2.

Federal

- At the federal level, policy efforts are underway to provide financing for tele-ICU expansion and Medicare payment for tele-ICU services. In December 2010, the CMS Office of Clinical Standards and Quality began working with the American Telemedicine Association (ATA) and four critical care medical societies to explore financing for tele-ICU implementation in rural hospitals. Part of this effort, led by John Mathers, MD (ATA Board member), is a proposal for CMS to fund the connection of rural hospitals to existing tele-ICU hubs in the U.S. that have unused capacity. In California, this could potentially result in expansion of the number of satellites working with the three existing Sutter and JM tele-ICU command centers in Northern California. Tele-ICU command center presence is sparse in the western states. Other than Sutter and John Muir, there are only four command centers (Swedish Medical Center in Seattle,

WA; Banner Health in Mesa, AZ; Abrazzo Health in Phoenix, AZ; and Avera Health in South Dakota). While it is not yet known how much additional ICU capacity could be handled by existing California or other command centers, it is a logical next step in expanding critical care access in rural communities and one that would be embraced by California's existing tele-ICU care providers. California could be well positioned to capitalize on this federal financing for rural tele-ICU expansion.

- The ATA is also working with CMS to change Medicare reimbursement regulations so that physicians providing tele-ICUs and telehealth services can begin receiving payment from CMS for services to Medicare recipients.
- The Center for Medicare and Medicaid Innovation (CMI) was recently charged with exploration of tele-ICU expansion. Part III of the CMI Agenda calls for programs "that will facilitate inpatient care, including intensive care, of hospitalized applicable individuals at their local hospital through the use of electronic monitoring by specialists, including intensivists and critical care specialists, based at integrated health systems." Funding available from CMI should encourage hospitals to explore the implementation of tele-ICUs.
- The Leapfrog Group is one of the leading national associations of health care employers and purchasers focused on health care quality, safety and value. Leapfrog's hospital quality ratings call for full-time intensivist staffing (or rapid access to intensivist consultation) as a way to save as many as 50,000 lives per year. Since publication of NEHI's Massachusetts tele-ICU demonstration, NEHI has been in discussion with The Leapfrog Group about potentially changing this critical care standard.
- The Joint Commission is the leading hospital and health system accrediting agency in the U.S. In an important health care industry policy development, the Joint Commission recently approved Proxy Credentialing for telemedicine. Proxy Credentialing is a Joint Commission-approved agreement between collaborating hospitals that serves to 'proxy credential' physicians named in the agreement. Treatment can be provided remotely by physicians named in the agreement using any/all forms of telemedicine. CMS is currently reviewing proxy credentialing to determine whether CMS will endorse this change in credentialing policy and a decision is anticipated this year.
- Another policy development of relevance to tele-ICUs is the emergence of Accountable Care Organizations (ACOs) as a component of the Affordable Care Act. As ACOs begin to tie provider reimbursements to quality metrics and reductions in the total cost of care for an assigned population of Medicare patients, they will have incentives to foster regional efforts to organize and rationalize care delivery so that high quality, efficient care is provided to their patient populations. Tele-ICUs could be included in planning efforts among hospitals in a region to support more rational critical care delivery to patients.
- In 2010, the Accreditation Council for Graduate Medical Education approved and implemented new Resident Work Hour Rules that all accredited medical schools must follow. The new Rules require shorter resident shifts and increased supervision by attending physicians. Tele-ICUs could be a mechanism for training and supervision of residents in critical care units and another incentive for the adoption of this technology.
- Expansion of tele-ICU networks typically results in increased levels of patient acuity in community hospital ICUs as the community hospitals are able to retain sicker patients in their ICUs with support from tele-intensivists. As patient acuity increases in hospitals that would have previously transferred high acuity patients, nurses and physicians face new challenges in delivering high quality critical care. This was the situation in a rural Northern California hospital

after robotic telemedicine was adopted. At this time, the American Association of Critical Care Nurses (AACN) is developing new requirements for critical care nurse training for tele-ICUs, "a new sub-specialty of critical care nursing." Workforce training, staff configuration and skill levels will all need to be addressed in hospitals and regions where the introduction of the tele-ICU technology rapidly changes the level of care a hospital is able to deliver.

California

Important policy developments underway in California will also reduce barriers to tele-ICU adoption:

- Statewide broadband deployment currently underway through the California TeleHealth Network (CTN) will dramatically increase rural access to telehealth across the state. This new broadband infrastructure will enable tele-ICUs and telehealth expansion into regions with limited access to intensive care.
- The Center for Connected Health Policy released its Final Report and Recommendations for the California Telehealth Model Statute Project on March 1, 2011. The release of this report is well-timed to address barriers to successful telehealth planning and operations and to expand access to critical care and specialty care services in areas with unmet needs. This Report contains 13 policy recommendations including a redefinition of telemedicine as telehealth, removing existing restrictions in state law, incorporating telehealth into state law, and other statutory and administrative practice and policy improvements. According to CCHP, many of these recommendations apply directly to tele-ICUs, particularly in regard to questions of interoperability of hardware/software and payment for services.

Options and Recommendations for Phase 2

Based on the Phase 1 research and findings summarized above, Phase 2 action steps for this project are recommended in two areas:

- Build the case for tele-ICU adoption among targeted regions, systems and providers to expand critical care capacity in areas with identified needs and opportunities; and
- Capitalize on timely policies to foster tele-ICU expansion in California.

Each recommendation is described in more detail below.

Build the case for tele-ICU adoption among targeted systems.

A recommended focus of Phase 2 is building the case for tele-ICU adoption among targeted hospitals and systems in regions where gaps in critical care access and efficiency could be addressed through tele-ICU technology. Target regions include Los Angeles, Riverside and San Bernadino Counties, and areas of the Central Valley. Building the case for action among these regions will require additional data analysis and a communication and outreach strategy aimed at target hospital systems and key payers and purchasers (including CalPERS and the Pacific Business Group on Health).

Executive interviews identified specific hospital systems and some unaffiliated hospital targets for tele-ICU discussion in Phase 2. Among these targets, Sutter and JM are both eager to expand their tele-ICU programs and add satellite ICU locations. Adventist Health and Catholic Healthcare West report they have (and would) consider tele-ICUs as a strategy to increase access to intensivists particularly in rural areas. Kaiser would likely consider adopting tele-ICUs if solid evidence of clinical impact can be demonstrated. Ridgecrest Regional Hospital (in the Eastern Sierra) has considered tele-ICUs but has been unable to fund it. These (and other) hospital systems could be contacted in Phase 2 to further develop strategies for expanding critical care capacity through tele-ICUs.

Gathering and disseminating information to help systems and hospitals understand the potential benefits and define the business case for tele-ICU adoption is a second recommended Phase 2 activity. Additional stakeholder interviews with target systems could be performed in Phase 2 to clarify the tele-ICU opportunity; determine the level of interest in tele-ICU adoption among systems (their interest in supporting a tele-ICU satellite or command center); provide information that will help systems evaluate and make the case for tele-ICUs; determine potential tele-ICU network opportunities (based on referral patterns/relationships and regional need for ICU capacity), explore tele-ICU funding and ROI potential; and determine other information that systems may need to successfully implement tele-ICUs. A synthesis of guidelines for successful tele-ICU adoption could be developed and disseminated. These guidelines could help California providers assess tele-ICU technology, reduce operational barriers to tele-ICU adoption, successfully implement tele-ICUs and effectively expand critical care capacity through this technology. Interviews with California payers and purchasers would also be undertaken to determine their level of interest in expanding critical care access and efficiency through telehealth, and to explore potential ICU cost savings associated with tele-ICUs and possible opportunities for tele-ICU funding and reimbursement.

Additional regional analyses could be performed to guide strategic expansion of critical care resources through tele-ICUs. This could include examination of providers and provider relationships in target regions, existing ICU referral patterns, ICU outcomes, variation in ICU ALOS, key drivers of ICU "capacity pain", and hospitals' ability to handle more complex cases that would be retained with 24/7

tele-intensivist support. These analyses would help clarify the opportunity for benefit from tele-ICUs in California regions where there are unmet needs for critical care or opportunities to improve critical care efficiency and capacity.

Implement a policy action plan.

Important federal and state policy developments now underway can support tele-ICU expansion. Two of these are particularly timely and involve actions that the project team could take in Phase 2 that would benefit critical care in California.

Working with ATA and federal policymakers, the project team could help jumpstart a federal program for tele-ICU in rural hospitals with California serving as a pilot state for rural tele-ICU funding and expansion.

Working with The Leapfrog Group, the project team could help develop a hospital rating for critical care that would award recognition to hospitals that have 24/7 intensivist staffing and tele-ICU care. Hospital systems contracting with payers that serve large employers (like Kaiser and most large hospital systems in California) will be motivated to achieve high Leapfrog ratings.

In conclusion, a multi-pronged approach to tele-ICU expansion is recommended in Phase 2. This approach would take into account regions with identified need for critical care expansion and regions where critical care quality, efficiency and capacity could be improved. This approach would further develop the case for tele-ICU adoption and return on tele-ICU investment among California health systems as a strategy to improve ICU efficiency and capacity. It also would capitalize on timely tele-ICU funding and policy opportunities at the national level to further support tele-ICU adoption in California. These recommended Phase 2 activities could move *Planning for Tele-ICUs in California* into action that would improve critical care access, capacity, efficiency, quality and cost in California.

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