Challenges in Critical Care Medicine: An Overview of Puerto Rico's Intensive Care Units

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Objective: Puerto Rico (PR) has undergone rapid changes during the last decades. Some of these involve the health care system and the delivery of care to the critically ill patient. With this in mind, we investigated how the intensive care units throughout our island's hospitals are organized so that we could establish a profile of the adult intensive care units (ICU) in PR.

Methods: From January 1, 2010 through April 30, 2010, questionnaires were distributed by e-mail or fax to every hospital that maintained a critical care unit. The questionnaires asked for such details as the structure of the unit; whether is use on an open or closed model; the number of beds in the unit; the total number of faculty members in the unit; the credentials of the unit's medical faculty and nursing staff; whether critical care service was available, and the different people in-charge of the unit during the day and at night.

Results: A total of 33 questionnaires were distributed, of which 19 were collected and analyzed. Among the ICU directors who responded, the predominant specialty was cardiology. Surprisingly, only 26% of the hospitals had critical care specialists. In most of the institutions, an internist or a primary care physician was on site during the day, this individual directly supervised patients and had decision making authority. At night, however, patients were managed by supervising nurse with limited ability to medically identified patient complications , though primary care physician was always available by phone if a critical decision needed to be made. Some of the units used protocols as part of their medical-management armamentarium.

Conclusion: Although only a small percentage of the island's ICUs participated in our project, the study's findings serve as evidence of the need to re-evaluate the delivery of care to the critically ill population. [*P R Health Sci J 2013;4:165-169*]

Key words: Intensive Care Units, Critical Care, Closed Units, Open Units

The beginnings of intensive care medicine can be traced back to the Crimean War and, particularly, Florence Nightingale, who was to become known as "The Lady with the Lamp." This English nurse was the first person to implement a critical care protocol, a protocol that ended up having a notable impact on the mortality rate of the time. Ms. Nightingale wrote about the advantages of establishing a separate area of the hospital for patients recovering from surgery. From this idea grew the practice of distinguishing between ordinary and more critically ill patients. However, it wasn't until almost a century later that intensive care medicine was truly "born"; during World War II, soldiers who had been injured in battle or who were undergoing surgery began to receive their critical care in newly established "shock" wards.

The past recognition that patients with acute, life- threatening illnesses should receive treatment in a separate part of the hospital that that which houses less critical patient is what spurred the growth and progression of critical care medicine. The first multidisciplinary intensive care unit (ICU) in the United States was created in 1958 at a hospital in Baltimore, which hospital is known today as "Johns Hopkins Hospital". Here, for the first time, in-house physicians (in this case anesthesiology residents) tend to critically ill patients 24/7. Later, in the 1970's, a group of physicians gathered together in Los Angeles, California, to form an organization known as the "Society of Critical Care Medicine". Since then, this organism has been committed to ensuring that critically ill patients receive the best possible care. This subspecialty has evolved as much as medical science has progressed. Currently, the major challenges faced by ICUs are the organization (i.e., closed vs. open) of the unit, resource

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allocation, staffing, costs, and the physical structure of the unit itself. A growing body of evidence suggests that quality of care in the ICU is strongly influenced by two important things: whether intensivists are providing care and the organization of the staff. Studies have suggested that differences in the organization of a given intensive care unit (ICU) may affect patient outcomes in that ICU (1). It has been well demonstrated that the presence of an intensivist in the ICU is linked to decreased mortality, length of stay, and costs (2). The practice of critical care medicine in Puerto Rico has undergone rapid changes in the last decades, most of them secondary to health care reform issues. A total of 12,500 physicians are practicing medicine in Puerto Rico, and only 30 of them are critical care specialists, representing less than 1%. With this in mind, we thought to describe the practice of adult critical care medicine in Puerto Rico.

Methods

Approval from the Institutional Review Board was obtained and a survey was performed from January 1, 2010, through April 30, 2010. A list of the hospitals that were members of the Puerto Rico Hospital Association in 2010 was made, and the sample was captured based on the hospitals that claimed to have a critical care unit, either surgical, medical, or both. Seventy-seven institutions were identified, of which 48 had critical care unit. The hospital administrators from the 48 qualifying hospitals were contacted by telephone and those who agreed to participate in the study received a formal letter from the Puerto Rico Critical Care Society explaining the purpose of the study. A questionnaire was developed to assess the structure, organization, and staffing of the units. This questionnaire explored a number of other issues, as well, including the availability of nutrition and respiratory therapy services; whether there was a pharmacy doctor on staff; whether the unit had implemented a graduate medical education program or any other training program or contained a research arm; and what protocols, if any, the unit had implemented. We sent the questionnaires by fax, email, and standard mail. After completing the questionnaires, respondents sent them to the pulmonary department of our institution for data gathering and analysis. Each questionnaire was validated by physicians from our institution, including the medical director, who is a pulmonologist, and other internal medicine physicians.

Results

Of the 48 hospitals identified as having an intensive care unit, 33 were enrolled and 19 completed the questionnaires.

Organization, staffing, and resources

The average numbers of beds per hospitals was 209; of these 15 were designated to the critical care units, all of which units utilized the open model of ICU organization. Faculty members were identified; among them were 26 physicians who were board certified in their particular specialties, with the remainder being board eligible. Only 68% of the ICU directors were board certified, each had 11 years of experience, on average (Table 1). The distribution of ICU directors by subspecialty was as follow: cardiology 37%; pulmonology 21%; intensivist 16%; internist 11%; pulmonary and critical care 10%; and surgery 5% (Fig 1).

Table 1. Intensive Care Unit

Category	Total
Total hospital beds	80-300 (209.5 average)
Total ICU beds	10-20 (15.3 average)
Total faculty members	100-225 (150.5 average
Board certified faculty	10-80 (26 average)
Years of experience as ICU director	5-15 (11.5 average)
ICU director board certified	13/19 (68.4%)
In-house MD	14/19 (73.6%)
Graduate medical education	10 /19 (52.6%)
Research programs	9/19 (47.3%)
Is it better to have an intensivist?	18 /19 (94.7%)

Of the faculty members, only 11% had any formal training in critical care medicine and while 89% of the hospitals had at least one intensivist on their faculty, only 46% had a critical care consult service available.

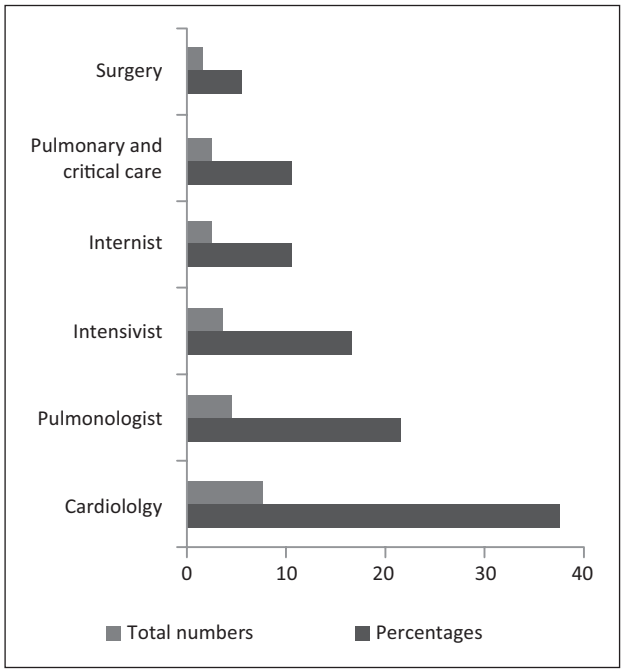

Figure 1. Distribution of ICU directors by subspecialty

Critical care unit patients were supervised during the day by an internal medicine specialist in 37% of the units; 26% of the units had a primary physician or medical resident, 16% had a critical care specialist, 16% had a subspecialist other than an

intensivist, and 5% had a hospitalist (Fig 2). At night, a nurse manager/supervisor managed the nurses and dealt with patient complications in 26% of the units, a medical resident had these responsibilities in 32% of the units, a fellow supervised by an attending physician in 16%, an attending physician alone in 16%, and a house staff physician in 10%. All of the physicians involved in patient care were available by phone for consultation and were within a 20 to 25-minute drive from their respective hospitals.

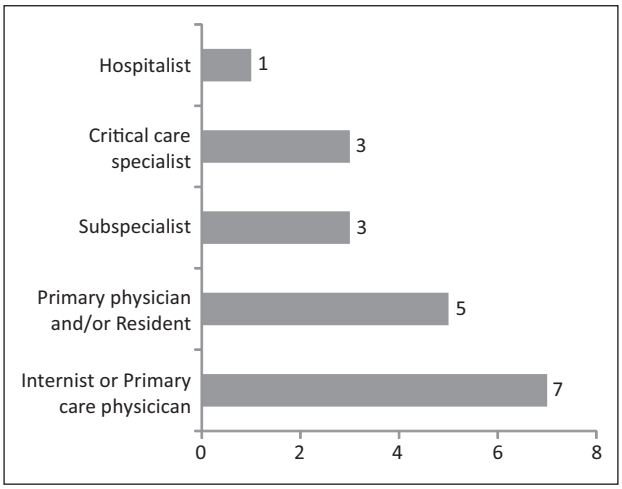

Figure 2. Patient supervisor at the ICU during the day.

At the time of the study, an average of 19% of each ICU staff consisted of revalidated nurses and an average of 2.3% of each staff was composed of licensed practical nurses. A nurse to-patient ratio of 2:1 was reported in 95% of the cases. Only 1.9% of the nurses had master's degrees and 6.7% had formal training in critical care medicine. Health care professionals, in the form of nutritionists, respiratory therapists, and pharmacy doctors were available full time at 21%, 63%, and 21% of the centers, respectively. A number of institutions were involved in research and/or offered graduate medical education for nursing, pharmacists, and/or respiratory therapy.

Services and protocols available

An evaluation of the services provided in the ICUs of the respondents revealed that 16% of the institutions had an established infection control program, 14% had physical therapy, 14% offered social work services, 13% provided consultations with regard to skin care, 13% had discharge home planning, 11% offered pastoral care, 6% offered speech and swallow therapy, 6% offered occupational therapy, 5% had employees who worked with palliative care, and 2% had employees certified in thanatology.

Several protocols were used by some institutions, which protocols included those that pertain to chest pain (18%), pneumonia (13%), discontinuation of mechanical ventilation (11%), deep venous thrombosis prophylaxis (10%), acute coronary syndrome (10%), glucose control (9%), sedation (8%), weaning (6%), and nutrition (6%); 5% of the responding institution used all of the protocols. As for the availability of interdisciplinary rounds as part of a given ICUs "modus operandi", half of the units had implemented such. Figure 3 shows those protocols recognized as being critical to the effective management of patient comorbidities and to the improvement of patient care. Protocol implementation and application represent an important issue, as multiple studies have shown that the proper utilization of the pertinent protocols results in a significant decline in complications and an overall improvement in patient care (3, 4, 5, 6, 7).

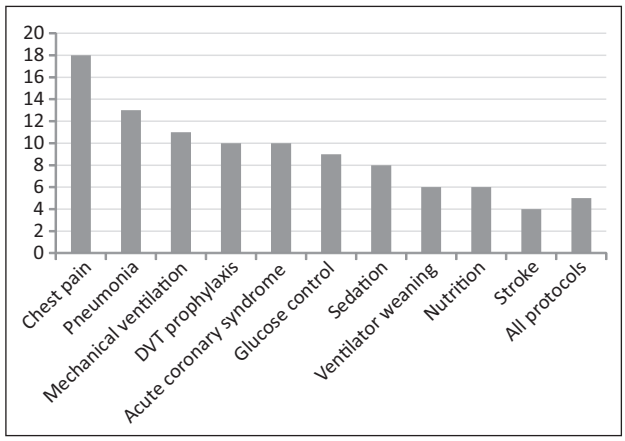

Figure 3. Distribution of protocols in use in the participating ICUs (in %).

The effect of critical care specialist on morbidity, mortality, and costs

When the issue of the impact of having a critical care specialist available 24 hours a day at the institution was examined, we found that 60% of the institutions believed that having such an individual was associated with decreased morbidity, mortality, and costs. However, when the reasons for the absence of such a service were explored, 11% of the participants indicated that it was too expensive for the institution, 5% claimed that there was no difference between having or not having the service, 42% simply had no critical care service, and 42% had reasons different from the ones provided on the questionnaires.

Upon completing our study, we discovered that no institution in Puerto Rico had a 24/7 in-house intensivist in charge of the ICU. Another alarming fact was that a significantly low number of intensive care units had any kind of disease-specific protocol implemented at all.

One of the weaknesses of this study is that only 25% of the intensive care units completed the questionnaire, so not all of the island's intensive care units could be included.

Discussion

The design of a particular hospital's intensive care unit should be undertaken by a multidisciplinary team consisting of, but not limited to, the ICU medical director, the ICU nurse manager, members of the hospital administration, and the requisite architectural and engineering personnel. This developmental team should assess the expected demands on the proposed ICU based on an evaluation of its sources of patients, admission and discharge criteria, the expected rate of occupancy, and the services provided by other hospitals that may be in the area. The ability to provide specific levels of care must be determined by analyzing physician resources (nursing, respiratory therapy, etc.) and the availability of support services (for example, an on-site pharmacy) (8). We present here the first descriptive analysis of adult critical care service in Puerto Rico.

Patients receiving medical care in ICUs account for nearly 30% of acute-care hospital costs, yet these patients only occupy 10% of the inpatient beds (9). In 1984, the Office of Technology Assessment concluded that 80% of the hospitals in the United States had ICUs; 20% of those hospitals' budgets were consumed on the critically ill population, and approximately 1% of the gross national product was spent for intensive care services (9). In Puerto Rico, 62% of the hospitals have ICUs. With the aging of the US and Puerto Rican populations, greater demands for critical care services will occur. At the same time, the evolution of market forces may constrain the abilities of both hospitals and practitioners to satisfy this impending need. In addition, managed care organizations are requesting justification for services provided in the ICU and demonstration of both efficiency and efficacy (9).

In the past several decades, this heightened awareness of both costs and service delivery has resulted in an increase in the attention given to how to maintain a high level of care while simultaneously minimizing costs. Accordingly, efforts have been devoted to organizing and promoting the effective use of already scarce resources. Hanson et al. refer to this concept as the "industrialization of the medical industry", which alteration to the health care landscape has significantly altered the provision of health care in the United States (10). These changes reflect the fear that costs will eventually become prohibitive, both for individuals and corporations, or will divert funds from other essential areas, such as education and research (10, 11). In Puerto Rico, one of the main problems we have been experiencing in the last decade is the instability of the budget directed towards health care services. Nevertheless, efforts are made on a daily basis to deliver the best quality of treatment to patients.

One of the major changes that have caused a revolution in critical care medicine is the development of "closed" ICU models. The term "open" (versus "closed") refers to the extent to which an intensivist is involved in a given patient's care. In the "open" model of organization, the day-to-day management decisions are made by the primary physicians. In the "closed" model of organization the full-time ICU physician staff controls all admissions and discharges, orders, and clinical management for all patients in the unit. This contrasts markedly with the open unit model. Closed ICU models emphasize the importance of the team and of continuity of care; concepts introduced by Rainey in 1994 when he became the president of the Society of Critical Care Medicine in the United States, and which concepts have since been re-emphasized by Parrillo (12, 13). The development of these organizational models is related to decreases in hospital/ICU lengths of stay, in the number of ventilation days, and in mortality (14). In Puerto Rico, so far, there are only 3 closed medical intensive care units.

Various international studies have emphasized the necessity of improving the delivery of critical care services, an improvement that is needed in Puerto Rico, as well. These findings clearly underline our island's need to re-structure the critical care models and serve to demonstrate to those who are part of the health care system the desire that patients have in seeing these changes happen. We encourage the population as a whole, including patients, physicians, nurses, and hospital administrators, to collaborate in further medical investigations in order to improve the quality of service. The only way to do this is to learn what is happening and identify the areas that need to be worked on. At this time we have only 1 critical care training program which program usually graduates 2 physicians per year, some of whom leave Puerto Rico seeking better workplace environments and lifestyles. Health care workers need more educational opportunities and incentives in their work to stimulate proficiency. Critical care units need to be the focus of our intensivists, and implementing the use of protocols should perhaps be every critical care unit's goal. There is no doubt that more studies focusing on critical care medicine in Puerto Rico need to be undertaken. In view of our study's small sample, it would be less accurate to claim that these findings represent the opinion of the majority. Having a critical care specialist available 24 hours a day, seven days a week, is not at this time a reality in Puerto Rico, but such coverage should be our goal, one that is both realistic and eminently attainable.

Resumen

Objetivo: Puerto Rico (PR) ha experimentado cambios rápidos en las últimas décadas. Algunas de ellas implican el sistema de atención de salud y la prestación de la atención al enfermo crítico. Con esto en mente, investigamos cómo las unidades de cuidados intensivos de los hospitales de nuestro

país se organizan y establecer un perfil sobre las Unidades de Cuidados Intensivos (UCI) de adultos en PR. Métodos: A partir del 1 de enero de 2010 hasta el 30 de abril de 2010 cuestionarios fueron distribuidos por correo electrónico o por fax a los hospitales que afirmaban tener una unidad de cuidado intensivo. Los cuestionarios incluían preguntas sobre: la estructura de la unidad, si estos utilizan un modelo abierto o cerrado, número de camas en la unidad, número total de miembros facultativos en la unidad, los credenciales de la facultad de medicina y de enfermería, la disponibilidad de servicios de cuidado crítico y las persona a cargo de la unidad durante el día y durante la noche. Resultados: Un total de 33 cuestionarios fueron distribuidos, de estos 19 fueron recogidos y analizados. Entre los directores de ICU que contestaron, la especialidad predominante fue cardiología. Sorprendentemente, sólo el 26% de los hospitales tenían un especialista en cuidado crítico. En la mayoría de las instituciones un médico internista o primario estuvo a cargo de la supervisión y toma de las decisiones en la unidad durante el día. En la noche, un supervisor del personal de enfermería con menor conocimiento en medicina y las posibles complicaciones que pueden ocurrir, supervisaba los pacientes en la unidad, subordinada por los diferentes médicos primarios de cada paciente. Algunas de las unidades utilizan protocolos como parte de las herramientas de gestión médica. Conclusión: A pesar de que un pequeño porcentaje de las UCI de nuestro país participaron en nuestro proyecto, estos hallazgos sirven como evidencia de la necesidad en nuestro país para evaluar la prestación de la atención de la población en estado crítico.

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