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After prolonged debate Chestnut Hill Hospital, a small community facility in Chestnut Hill, Pennsylvania, opened a small room designated solely for the care of the critically ill in May 1954. The next intensive care unit to open in the Philadelphia area, at the Hospital of the University of Pennsylvania (HUP), debuted in February 1955.[1] By 1961, 50 percent of the thirty-two hospitals in Philadelphia reported having intensive care units.[2] The "acute room," as the new intensive care area at Chestnut Hill Hospital was first called, provided round-the-clock nursing service to critically ill patients and a "safety net" for postsurgical patients after the recovery room closed in the late afternoon.

As this case will show, the intensive care unit was not the only strategy the hospital could have chosen to provide care to its critically ill patients. It was, nonetheless, a strategy that initially fit the economic goals of the

1. Julie Fairman, "New Hospitals, New Nurses, New Spaces: The Development of Intensive Care Units, 1950–1965" (Ph.D. diss., University of Pennsylvania, 1992), p. 182.

2. Robert E. Coughlin, "Hospital Complex Analysis: An Approach to Analysis for Planning a Metropolitan System of Service Facilities" (Ph.D. diss., University of Pennsylvania, 1964), p. 68.

hospital, as it invested in both traditional and nontraditional patterns of rendering care to patients. In this paper, I explore the development of the intensive care unit at Chestnut Hill Hospital and examine the context in which this technologic system of caring for critically ill patients developed.[3] My analysis will provide a glimpse of the foundation of contemporary dilemmas surrounding this most expensive form of hospital care, as the meaning and substance of intensive care changed over time for its multiple participants.

Although intensive care has become the symbol of the highly technical aspects of contemporary health care and its associated dilemmas, I will argue that contrary to earlier accounts, neither machines nor new therapeutics drove the development of intensive care at Chestnut Hill.[4] The analysis of this case study will uncover the complex dimensionality and often contradictory nature of knowledge and practice as seen in the paradox of the daily clinical practices of nurses and physicians and the possibilities offered by new medical knowledge. In the process, heterogeneous factors such as economics, class, and gender become important parts of the story.

A local story of technology development can contain a narrative that bridges human experience with larger theoretical constructs. The illumination of the importance of daily realities provides an interesting counterpoint to the seemingly natural trajectories of technological change and the apparent superiority of one technology over another. The story becomes less linear, exposing the turbulence of the time and the diffi-

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3. In this paper the intensive care unit is viewed as a technologic system—as a system of tools, skills, and knowledge to care for critically ill patients. The analysis occurs from the perspective of the social context within which the technology resides, and includes machines, patients, and care providers as part of the technologic process. See Judith A. McGaw, "Women and the History of Technology," *Signs,* 1982, *7:* 802; idem, *Most Wonderful Machine: Mechanization and Social Change in Berkshire Paper Making, 1801–1885* (Princeton: Princeton University Press, 1987). Other scholars who frame their analysis with a broader view of technology include David A. Hounshell, *From the American System to Mass Production, 1800–1932: The Development of Manufacturing Technology in the United States* (Baltimore: Johns Hopkins University Press, 1984); Merritt Roe Smith, *Harpers Ferry Armory and the New Technology: The Challenge of Change* (Ithaca: Cornell University Press, 1977); Joel D. Howell, *Technology in the Hospital: Transforming Patient Care in the Early Twentieth Century* (Baltimore: Johns Hopkins University Press, 1995).

4. Most earlier accounts of the development of intensive care rely heavily on machines and advanced therapeutics as deterministic factors. See, for example, Steven M. Ayers, "Introduction: Critical-Care Medicine," in *Major Issues in Critical-Care Medicine,* ed. Joseph E. Parillo and Steven M. Ayers (Baltimore: Williams and Wilkins, 1984), pp. xvii–xx; William A. Knaus and George E. Thibault, "Intensive Care Units Today," in *Critical Issues in Medical Technology,* ed. Barbara J. McNeil and Ernest G. Cravalho (Boston: Auburn House, 1982),

culty of choosing a particular course of action.[5] Different kinds of questions may be raised that digress from the typical, although important, inquiries concerning successful models of development. In the case of intensive care, could the care of the critically ill have been structured in any other way? What would have happened if the hospital had hired more nurses for the general floors, or if it had paid private-duty nurses more money to care for more than one critically ill patient? Did intensive care, under the guidance of those who had an investment in the idea, engender a self-reinforcing belief that it was a "good" concept? By conducting the analysis in the light of these questions, I show that the development of a particular technology, intensive care, becomes less a story of its "intrinsic superiority" than a window through which to observe the interactions among knowledge development, the relationships of the actors within a particular system, and technology.

The intensive care unit,[6] a conceptual and spatial recategorization and reorganization of the care of critically ill hospital patients into architecturally discrete areas with a concentrated group of nurses providing continuous care, did not become institutionalized in hospitals until mid-century. Although the effectiveness of the triad of concentrated nursing care, triage, and vigilance in the care of critically ill patients was documented by nurses and physicians working in recovery rooms, field hospitals, and polio units, the required integrity of the three concepts became a reality only when the hospital environment and societal expectations of medical care of the 1950s made them economically practical and critically necessary.[7] Reports of the innovative reorganization of the care of the critically ill began to appear in hospital journals in late 1954, when Robert Cadmus reported on the pediatric unit opened in 1953 at the North Carolina Memorial Hospital, Chapel Hill, North Carolina. Manchester Memorial Hospital, Manchester, Connecticut, also opened an intensive care unit in 1953, as did other hospitals, but their accounts

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pp. 195–98; Mark Hilberman, "The Evolution of Intensive Care Units," *Crit. Care Med.,* 1975, *3:* 159–65. An exception to this view is presented by Jacqueline Zalumas, *Caring in Crisis: An Oral History of Critical Care Nursing* (Philadelphia: University of Pennsylvania Press, 1995); Julie Fairman and Joan Lynaugh, *Critical Care Nursing, A History* (Philadelphia: University of Pennsylvania Press, 1998).

5. Donald MacKenzie, *Knowing Machines: Essays on Technical Change* (Cambridge: MIT Press, 1996), pp. 5–8.

6. Early areas were called "critical recovery areas," "special care rooms," "intensive rooms," or "critical rooms." The term "intensive care" seems to reflect the flavor of the time period and adds consistency to my discussion.

7. Fairman and Lynaugh, *Critical Care Nursing* (n. 4), chap. 1. During wars, epidemics, and other crises, triage, rapid treatment, and concentrated care were provided on an ad

were not as publicly heralded. The early reports were somewhat hidden, appearing in the *Index Medicus* under the heading "recovery room"— probably because some of the earlier units were called "recovery areas" (e.g., "critical recovery unit"). Intensive care did not receive an independent heading until the 1955–59 *Index Medicus* issue.[8]

The development of intensive care at Chestnut Hill Hospital is an interesting case to analyze because, as a small community hospital, its story presents an engaging mesh of local, parochial interests and national trends not immediately seen in larger, elite institutions. The experiences of the physicians, nurses, administrators, trustees, and patients at Chestnut Hill during the 1950s were encompassed and defined by the community in which they resided and worked, and their responses to the dilemmas faced by the hospital were circumscribed and contextualized by the institution's place in both the community and the larger health-care system. This is a local story, but one that allows us to place the national context in perspective and to open it for inspection.

Overview

In 1950, Chestnut Hill Hospital was a 106-bed voluntary, community hospital consisting of three small wards and 63 semiprivate and private beds.[9] In absolute size, it resembled 32 percent of short-term, nonprofit general hospitals, and yet it was close enough in size to be representative

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hoc basis according to the criteria of salvageability. During World War II and the Korean War, the ability to survive transport was added to the mix.

8. Nathan M. Simon to J. Don Miller, [undated], Chestnut Hill Hospital Medical Library, Chestnut Hill, Pa. (henceforth CHH); Lewis E. Weeks, *The Complete Gamut of Progressive Patient Care in a Community Hospital: An Experience Brochure* (Battle Creek, Mich.: Kellogg Foundation, 1966), pp. 16–17; Early published reports include Robert R. Cadmus, "Special Care for the Critical Case," *Hospitals,* 1954, *28:* 65–66; Elizabeth A. Bell, "Special Nursing Unit Relieves the Strain," *Mod. Hosp.,* 1954, *83:* 74–75; Max S. Sadove, James Cross, Harry G. Higgins, and Manuel J. Segall, "The Recovery Room Expands Its Service," ibid., pp. 65–70; J. Don Miller, "The Critical Care Unit in a 134-bed Hospital," *Hospitals,* 1956, *30:* 46–47, 96. Although it may be argued that the lines between these classifications (recovery room and intensive care unit) were negotiable in the hospitals of the time, the recovery rooms were extensions of the operating room rather than a reorganization of patients by level of stability. Recovery rooms served only surgical patients, they were open only during the usual weekly and daily schedule of the operating rooms, and patients were still usually "under" the effect of anesthesia when assigned there.

9. By the end of 1953, semiprivate and private patients constituted 90 percent of the hospital population (Medical Staff Committee, Board of Trustees, minutes, 24 November 1953, CHH); by the end of 1954, 93 percent (Administrator's Report, Board of Trustees, minutes, 23 November 1954, CHH). Ward beds disappeared in the early 1970s.

Table 1. Bed complement at Chestnut Hill Hospital, 1950–1960

	1950	1955	1960
Total	104	141	180
Private	17	15	10
Semiprivate	46	99	136
Ward	41	27	34

Sources: Compiled from Pennsylvania State Board of Nursing Survey, 1955, Chestnut Hill Hospital School of Nursing Collection, Center for the Study of the History of Nursing, School of Nursing, University of Pennsylvania, Philadelphia, Pa.; Board of Trustees, minutes, 1950–61, Chestnut Hill Hospital Medical Library, Chestnut Hill, Pa.

of the largest group of hospitals in this category (hospitals with fewer than one hundred beds).[10] Chestnut Hill Hospital closely mirrored the 1950s national trends of hospital expansion (supported in part by federal initiatives such as the Hill-Burton Act of 1946)[11] and increased hospital utilization by a growing pool of privately insured patients. Between 1950 and 1960, its admissions increased by 115 percent, patient days by 88 percent, and the number of hospital beds by 73 percent, with the largest increase realized in the semiprivate type of accommodation (Table 1).

Fifty-five percent of patients admitted to Chestnut Hill Hospital in 1950 carried Blue Cross benefit contracts that granted allowances for its subscribers to stay in semiprivate rooms.[12] Although there is no documentation of changes in insurance coverage over time for patients at the hospital, the growth in the number of and demand for semiprivate rooms, and the consistently lower ward occupancy, may indicate an expanded insured population. For example, in 1954 an average of one-third of ward beds were empty on a daily basis (occupancy rate of 63 percent), compared to less than one-tenth of private and semiprivate beds (occupancy rate of 93 percent).[13] The substantial semiprivate bed

10. American Hospital Association, "Statistical Guides," *Hospitals,* 1952, *26(2):* 25.

11. The Hospital Survey and Construction Act (Public Law 79–725), commonly known as the Hill-Burton Act, was signed into law by President Truman in 1946. It provided direct financial support for community hospital development and attempted to set standards for construction. In Pennsylvania, the funds were earmarked for rural and psychiatric hospital development.

12. Board of Trustees, minutes, 26 September 1950, CHH. In 1951, 40–60 percent of patients admitted to Philadelphia-area hospitals owned Blue Cross Benefit contracts: Chestnut Hill Hospital, *Thermometer,* 1951, *2:* 7.

13. Administrator's Report, Board of Trustees, minutes, 23 November 1954, CHH.

Table 2. Semiprivate admission waiting list at Chestnut Hill Hospital,
1954–1956

	Number of patients on waiting list	Number of semiprivate beds
September 1954	51	84
October 1954	70	84
November 1954	97	84
December 1954	126	84
April 1955	159	84
November 1955	89	99
October 1956	124	99

Source: Administrator's Report, Board of Trustees, minutes, various issues, 1954–56, Chestnut Hill Hospital Medical Library, Chestnut Hill, Pa.

waiting list (Table 2) and the frequent, but temporary, occupancy of ward beds by emergency patients with insurance to pay for a semiprivate room also suggest a growing insured patient population.[14]

The proportioning of accommodations could also be attributed to location and patient preference. Set in the affluent Philadelphia community of Chestnut Hill, the hospital drew its clientele from working-class and prosperous areas within a two- to three-mile radius. For example, in both 1948 and 1954 almost 50 percent of the patients served at the hospital resided in local affluent communities such as Chestnut Hill, Mt. Airy, and the working-class community of Germantown.[15] In contrast, an inner-city hospital with a large proportion of ward patients, such as the

14. Complaints about the presence of semiprivate patients in ward beds are noted throughout the minutes of the Board of Trustees; see the Administrator's Report, Board of Trustees, minutes, 1954–56, CHH. Semiprivate patients requiring emergency admission in the absence of available semiprivate beds, those without (or unable to pay) private physicians, or those preferring the ward accommodations gained admission to the ward.

15. "Considerations Relative to Staff Growth," January 1956, file marked "Expansion of Staff," CHH.

HUP, may have drawn nearly half of its patients from within a five-mile radius that included a large low-income community.[16]

Three entities—the board of trustees, the medical staff, and the administrator—governed Chestnut Hill Hospital. As in other small community hospitals, the trustees played an active role in the daily operation of the hospital, including the affairs of the medical staff. For example, it was the trustees rather than the medical staff who suggested that the chiefs of each service achieve diplomate status of their respective specialty boards, and that the medical and surgical staff reorganize from three services to two for more efficient administration.[17] Even so, the medical staff was well represented on the board of trustees and its various standing committees, and in the social clubs and organizations frequented by them.

The hospital administrator at the time, J. Don Miller, was an able, educated politician who supervised a decade of hospital expansion and ward conversion at Chestnut Hill.[18] In 1951, he directed the construction of a new wing that added twenty beds, and in 1959 a second expansion that added sixty-five beds. All the new accommodations were either private or two-bedded semiprivate rooms, representing community demand and changes in hospital architecture that mirrored suburban home construction and 1950s privacy ideals.[19] Miller was also keenly aware of reimbursement trends: Hill-Burton funding (which the hospital received in 1951) supported the construction of two-bedded rooms (instead of the traditional four-to-six-bed semiprivate room), and semi-private patients guaranteed the payment of hospital bills through their

16. *Annual Report of the Board of Managers,* 1963–1964, Hospital of the University of Pennsylvania, Philadelphia, Pa., p. 24.

17. Professional Staff Committee, Board of Trustees, minutes, 26 June and 25 September 1951, CHH. For descriptions of the relationships between trustees, administrators, and medical staffs in small community hospitals, see Temple Burling, Edith Lentz, and Robert N. Wilson, *The Give and Take in Hospitals* (New York: Putnam's, 1956); Ivan Belknap and John G. Steinle, *The Community and Its Hospitals: A Comparative Analysis* (Syracuse, N.Y.: Syracuse University Press, 1963). Charles Perrow also discusses the triad of power (trustees, administrators, and physicians) and the need for consensus between groups to achieve particular goals in "Goals and Power Structures: A Historical Case Study," in *The Hospital in Modern Society,* ed. Elliot Friedson (London: Collier, 1963), pp. 112–46.

18. Miller held a master's degree in hospital administration from the University of Wisconsin. By 1953, only 19 percent of all general, short-term, acute hospitals had administrators with graduate degrees in hospital administration, but this percentage increased over the decade: American Hospital Association, "Statistical Guides," *Hospitals,* 1953, *27(2):* 40.

19. Fairman and Lynaugh, *Critical Care Nursing* (n. 4), chap. 2; Clifford E. Clark, "Ranch-House Suburbia: Ideals and Realities," in *Recasting America: Culture and Politics in the Age of Cold War,* ed. Lary May (Chicago: University of Chicago Press, 1989), pp. 179–90.

private insurance or their own funds.[20] Miller astutely positioned the hospital to benefit from these funding and payment trends.

Laura Mae Beery became director of the school of nursing and nursing service in 1951, a position she held until her retirement in 1980. Although responsible for the nursing school and all nursing services provided by the hospital, she was not part of the group that governed the hospital and therefore was not in a position to participate in institutional policy-making. Her predecessor, Catherine Clark, had attempted to gain admission to the decision-making process by requesting admission to trustee meetings, but the trustees declined her request, noting that "it was not necessary for her to attend, as the heads of other [ancillary] departments would wish to be included."[21] On an episodic and individual basis, however, Beery's opinions and assistance were sought and valued by the administrator and physicians.

The Critically Ill at Risk

At mid-century, Chestnut Hill Hospital experienced the dual demands of more patients and higher levels of acuity within a system designed to care for stable patients, such as routine obstetrics cases, and those recovering from tonsillectomies and appendectomies.[22] Although the number of minor surgical cases remained stable (approximately 65 percent of the total cases), reflecting Chestnut Hill's position as a community hospital rather than a university-based research or referral hospital, the total number of surgical cases increased by 89 percent from 1950 to 1960.[23] The number of surgical procedures grew by an average of one hundred per year between 1950 and 1955.[24]

20. J. Don Miller, interview, 26 March 1990, Roxborough, Pa.; President's Report, Board of Trustees, 23 January 1951, CHH.

21. Executive Committee, Board of Trustees, minutes, 11 April 1949, CHH. The nursing committee became a standing committee of the board of trustees in 1955.

22. For the increased complexity of the patient population on a national level, see Fairman and Lynaugh, *Critical Care Nursing* (n. 4), chap. 2; American Medical Association, "General Report," *Commission on the Cost of Medical Care* (Washington, D.C.: American Medical Association, 1964), pp. 142, 149; Herbert E. Klarman, *The Economics of Health* (New York: Columbia University Press, 1965); "Changes in Nursing from the 1930's to 1953," *Nursing Res.,* 1956, *5:* 85–86.

23. Data derived from the minutes of the Medical Staff Committee, Board of Trustees, 1950–60, CHH.

24. Report of Chestnut Hill Hospital to the Pennsylvania State Board of Accreditation, 1950–55, Chestnut Hill Hospital School of Nursing Collection (CHHSON), Center for the Study of the History of Nursing, School of Nursing, University of Pennsylvania, Philadelphia, Pa. (CFSHN).

At Chestnut Hill Hospital, critically ill patients were those who had undergone major surgery or who were suffering from the acute effects of chronic illnesses such as asthma or heart disease. These patients required close observation and monitoring to detect abrupt changes in their condition. Miller did not, however, expect the hospital to assume the costs of providing the extra nursing care that these patients needed, because the hospital traditionally relied upon families to purchase the care of private-duty nurses. In fact, the hospital went to great lengths, using monopsonistic labor practices—whereby several sellers (and nurses) compete to provide services to a single buyer—to keep nursing salaries low, and relying on student labor to minimize nursing costs even as other hospital expenses continued to rise. The hospital was accustomed to assuming costs such as building maintenance and laboratory improvements, but professional nursing costs were a relatively new phenomenon. Until the early 1950s, the hospital had relied primarily upon private-duty nurses and student labor to provide most of the nursing care.[25] Miller wrote, "Hospital nursing staffs are not organized to give such close and intensive care except in rare cases."[26] Miller's expectations for family-financed care were shared by many physicians. To assure themselves that someone would observe and assist their critically ill patients in their absence, physicians encouraged families to hire private-duty nurses, especially for the evening and night shifts when professional nurse staffing was at its lowest level (Table 3).

Miller's assumption about the hospital's lack of financial obligation to provide for the greater needs of critically ill patients and physicians' concerns compounded a dilemma created by the hospital's inability to find enough qualified private-duty nurses to fill requests. The administrator noted: "the quality of private-duty nurses was deteriorating all the time. They were mainly older nurses. Younger nurses [with better skills] were not going into private-duty nursing."[27] He estimated that there were five to eight critically ill patients in the hospital every day who required fifteen to twenty-four private-duty nurses (one nurse each shift, for three daily eight-hour shifts), without counting those requested by wealthy patients for personal care.[28] Sometimes the hospital had to contact five or six nursing registries before enough nurses were found, and frequently it came up empty-handed.

25. Salary Committee, Board of Trustees, minutes, 19 December 1950, CHH.
26. J. Don Miller, "Report on New Nursing Service," *Philadelphia Med.,* 1955, *3:* 935.
27. Miller interview (n. 20).
28. Miller, "Critical Care Unit" (n. 8), p. 46.

Table 3. Nurse to Patient Ratio at Chestnut Hill Hospital, 1950–1960

Year	Day Shift	Evening Shift	Night Shift
1950	1:8	1:30	1:46
1952	1:7	1:10	1:17
1954	1:6	1:55	1:28
1956	1:8	1:17	1:40
1958	1:5	1:10	1:10
1960	1:6	1:7	1:12

Sources: Compiled from Board of Trustees, minutes, 1955–60, Chestnut Hill Hospital Medical Library, Chestnut Hill, Pa.; Pennsylvania State Board of Nurse Examiners Reports, 1950–60, Chestnut Hill Hospital School of Nursing Collection, Center for the Study of the History of Nursing, School of Nursing, University of Pennsylvania, Philadelphia, Pa.

Critically ill patients without private-duty nurses could have been more easily observed if they had been placed in a traditional ward setting. In the smaller semiprivate rooms favored by patients and the hospital, the lack of observation proved potentially risky. William McClenahan, a general practitioner and later chief of the medical staff at Chestnut Hill Hospital, understood the hazards of semiprivate rooms: "In recent years, for perplexing reasons," he wrote, "it has become the fashion to maroon sick people in private or semiprivate rooms. . . . What unconscious patient can ring a bell when he needs assistance? Who is to know of his need? What companion—other than an occasional visitor— is there to relieve loneliness and fear, the two common denominators of illness?"[29]

To compound the difficulties presented by both the changes in hospital room design to provide greater patient privacy, and the shortage of skilled private-duty nurses, the hospital also encountered problems in trying to attract the desperately needed interns and residents who supplied much of the direct medical care to Chestnut Hill Hospital patients. As a community hospital, Chestnut Hill did not have a medical school feeding potential interns and residents into the patient-care system, similar to the traditional link between the hospital and the nursing students in the training school. While private physicians performed surgery in the operating room, attended patients in offices outside the hospital, or were home at night, interns and residents provided emergency care, performed routine, time-consuming tasks, and coordinated

29. William U. McClenahan, *G.P.* (Philadelphia: Dorrance, 1974), p. 113.

the care of ward patients—but the small ward population and traditional limited access to private patients made the hospital's internship and residency positions unattractive. In 1952, Miller noted: "We are having difficulty getting residents; 4 are leaving for various reasons on January 1, and we have only 2 to replace them."[30] And in 1954: "We are disappointed [that] the hospital has obtained only 1 internship for 1954–1955, we need 5."[31]

When the hospital failed to attract American medical graduates, it followed the creative solution used by other hospitals of similar size and turned to foreign physicians, who eagerly entered American postgraduate training programs. "The present interns are overworked, and we have received no answers from the U.S. and Canada," the medical staff committee reported, "but inquiries from men in Cyprus, Greece, and England, they are eager to come if they can get on the quota."[32] Although the hospital and medical staff welcomed these physicians for the labor they provided, problems of language and culture sometimes limited their contributions.[33]

A shortage of interns and residents increased the workload of nurses during a period of high nursing demand and provided little support to them during emergencies.[34] To complicate matters, until 1956 nursing supervisors, assistant head nurses, or head nurses were not usually present during the night shift to assist students (who provided approximately 70 percent of the nursing care) and professional staff.[35] At night, without the benefit of supervisory personnel, nurses performed tasks usually executed by physicians during the day, such as changing wound dressings, inserting nasogastric tubes, and preparing wound cultures—tasks

30. Administrator's Report, Board of Trustees, minutes, 30 December 1952, CHH.

31. Ibid., 23 February 1954, CHH.

32. Medical Staff Committee, Board of Trustees, minutes, 14 February 1949, CHH.

33. For a short overview of internships and residencies filled by foreign graduates, see Rashi Fein, *The Doctor Shortage: An Economic Diagnosis* (Washington, D.C.: Brookings Institution, 1967), pp. 86–87.

34. For example, the hospital initiated a forty-hour work week in January 1953, a change that required a larger cadre of staff nurses to fill the shorter shifts—but the average number of professional nurses on day shift dropped from sixteen in 1952 to eight in 1953. The average number of nurses on evening shift also fell during the same time period, from ten nurses to five: Pennsylvania State Board of Nurse Examiners, Annual Report of the School of Nursing, 1950–56, CHHSON, CFSHN.

35. The absence of supervisors is derived from figures in ibid.; the percentage of student care is derived from School of Nursing Committee, Board of Trustees, minutes, 25 February 1955, CHH.

for which they were unprepared and had little time.[36] The amount of care provided to stable patients decreased, as nurses spent the bulk of their time moving from one critically ill patient to the next. As Faye Abdellah, assistant chief of the Division of Nursing Resources, U.S. Public Health Service, and E. Josephine Strachan, a nurse consultant in the Division of Hospital and Medical Facilities, U. S. Public Health Service, astutely noted, "the emergency was routine."[37]

Old Solutions in New Packages

Faced with an increasingly complex hospital population in accommodations that prevented easy observation, with an inconsistent availability of physicians, with difficulty in hiring private-duty nurses, and with low professional nurse staffing levels, the hospital initially tried two traditional solutions to care for critically ill patients. First, the director of nursing allowed second- and third-year nursing students to work as emergency private-duty nurses on their day off each week, to repay hospital loans;[38] and second, private-duty nurses were encouraged to practice group nursing by caring for two or more patients per shift. But these piecemeal solutions did not go far enough: students were usually not available for evening or night shift, when the demand was highest (they were usually assigned clinical rotations on these shifts), and many private-duty nurses refused multiple patient assignments, especially if one patient was critically ill.[39] The hospital declined to hire more professional nurses because the trustees and administrator thought this strategy would be too expensive.

In December 1953 the nursing committee of the board of trustees reported that they were "deeply concerned with the continuing full occupancy of the hospital since this made the giving of proper nursing care to every patient difficult."[40] At the same meeting, William McClenahan pointed out that

36. These practices persisted into the next decade: Surgical Staff, minutes, 27 November 1964; 25 March 1966, CHH.

37. Faye Abdellah and E. Josephine Strachan, "Progressive Patient Care," *Amer. J. Nursing,* 1959, *59:* 649–55, quotation on p. 649.

38. Nursing Committee, Board of Trustees, minutes, 24 November 1953, CHH.

39. The director of nursing discussed the reluctance of private-duty nurses to undertake group nursing in 1954 and 1957: Board of Trustees, minutes, 23 March 1954; Nursing Committee, Board of Trustees, 22 October 1957, CHH.

40. Nursing Committee, Board of Trustees, minutes, 22 December 1953, CHH.

the weak link in the service which the hospital was rendering to the community was in nursing care for the critically ill or unconscious patients. . . . With the high census, it has become a problem to provide adequate nursing care for seriously ill patients who need a nurse in constant attendance and who cannot obtain private-duty nurses.[41]

McClenahan went on to remind the trustees of his experiences in the large wards at Pennsylvania Hospital (Philadelphia) during his internship, where nurses moved the beds of critically ill patients close to the nursing desk for better observation; and in Evacuation Hospital #52 during World War II, where medical personnel grouped the sickest patients together for concentrated care. Based on these experiences, he suggested that most of the hospital's critically ill patients could be economically cared for by a small number of nurses—if the nurses could easily observe the patients.[42] To this end he advocated opening a six-bed ward with admissions limited to critically ill, postoperative, or unconscious patients. He did not gain immediate support for the idea, which the trustees and administrator considered too costly, but he was able to convince the trustees to open a four-bed postoperative recovery room less than two months later, on 3 February 1954, to at least provide better care for postsurgical patients.[43]

Surgeons admitted more than a thousand patients in the first four and one-half months of the recovery room's operation, indicating rapid patient turnover and a probable frenetic level of activity. However, the loss of income from the four previously semiprivate beds greatly concerned the trustees and the administrator, and dampened the already reluctant support that McClenahan had generated for a larger critical care area. J. Don Miller noted: "I fought against it [the recovery room] because we were losing four beds which was a certain amount of income and the thing was an expense to us. . . . Maybe we gave people better care but we were losing money."[44] However, faced with professional support for the recovery room and evidence supplied by national trends (by 1952, 43 percent of medium-sized hospitals provided recovery room services), Miller overcame his fears of financial difficulties and began to

41. Medical Staff, Board of Trustees, minutes, 22 December 1953, CHH.

42. Ibid.; McClenahan, *G.P.* (n. 29), pp. 113–14.

43. Medical Staff Committee, Board of Trustees, minutes, 22 December 1953, CHH; McClenahan, *G.P.* (n. 29), pp. 113–14. For the tradition of triage and concentrated care, see Julie Fairman, "Watchful Vigilance: Nursing Care, Technology, and the Development of Intensive Care Units," *Nursing Res.,* 1992, *41:* 56–60.

44. Miller interview (n. 20). Similar sentiments are also noted in the Administrator's Report, Board of Trustees, minutes, 23 February 1954; Treasurer's Report, Board of Trustees, minutes, 23 March 1954, CHH. The hospital lost $1500 dollars in February. The

understand the importance of the concept both as a necessary part of the hospital's mission and as a forceful public relations tool.[45]

McClenahan and Beery (who had supported the proposal early on) worked with Miller, their newly converted ally, to find a solution for the care of critically ill patients that went beyond the services provided by the recovery room and minimized the financial burden to the hospital. The trio realized that the trustees were still concerned about the income lost from semiprivate beds because of an expected year-end budget deficit. An estimated cost of $1,800 per month for nursing staff for the new area intensified and confirmed the trustees' concerns.[46] The trio did not believe that costs could be transferred to private insurers such as Blue Cross because the hospital's contract with the insurer explicitly demanded (as did all other hospitals' contracts) that all nursing service had to be provided to patients without additional charge, except for private-duty nursing, which was the responsibility of the subscriber.[47] The cost for nursing care had to be borne by the hospital or the patient, and the trustees were extremely reluctant to take on added nursing expenses.

Miller, McClanahan, and Beery devised a solution for the financial burden of the unit that was drawn from the traditional billing structure of private-duty nurses and from already established, although infrequently applied, hospital patterns. The hospital would hire extra nurses and pass on the expense to the patients by directly billing them rather than the insurer for intensive-care services, a process similar to private-duty billing. To minimize the cost to patients, two to three nurses would care for six patients to constitute a simple form of group private-duty nursing. The only differences between the traditional private-duty arrangement and the proposed solution were the party responsible for the

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cost of nursing care in the recovery room was not an issue, in contrast to the concerns raised by the costs of the intensive care unit, because the director of nursing did not have to hire additional nurses. Few nurses were needed to staff the four-bed recovery room because it closed after 5:30 P.M. and was not open on Sundays, so Beery merely reassigned nurses from the general staff pool.

45. Administrator's Report, Board of Trustees, minutes, 23 February 1954, CHH. The figure is for general and special, short-term, nonprofit hospitals, 100–249 beds: American Hospital Association, "Statistical Guides" (n. 18), p. 26.

46. Miller, "Critical Care Unit" (n. 8), p. 47. The unit opened with a staff of three nurses and two aides.

47. Miller interview (n. 20); Laura Mae Beery, interview, 22 January 1991, Chestnut Hill, Pa.; James P. Smith, Memorandum on Group Private Duty Nursing in Intensive Care Units, 7 April 1961, CHH. Smith was the director of the hospital division of the Associated Hospital Service of Philadelphia.

hiring and billing, and the "cut rate" fee the hospital proposed to offer. Twenty-four-hour private-duty nursing cost patients thirty-six dollars in 1954, but the hospital proposed charging them only twelve dollars for twenty-four-hour care in the new unit.[48]

To investigate Blue Cross permission for the group-nursing strategy, which the trio realized was needed to avoid invalidation of the reimbursement contract, Miller contacted E. A. Van Steenwyck, the executive director of the Associated Hospital Service of Philadelphia and a personal friend.[49] After some discussion, Van Steenwyck agreed to support the plan *only* on an experimental basis and *only* at Chestnut Hill Hospital. He insisted that Blue Cross's support remain unannounced because he feared a rapid surge in the use of the concept and the eventual inclusion of these services in the insurance contract.[50] Van Steenwyck may have been the only person who understood the future implications and popularity of hospital-financed intensive nursing care.

At the April meeting of the board of trustees, the professional staff and the administrator again recommended opening an intensive care area, but the board again postponed action, for two reasons: first, the board was preoccupied with planning the hospital's Fiftieth Anniversary celebration, which was a desperately needed fund-raising project; and second, the possibility of placing both male and female patients in the same room created enormous alarm among the trustees. The social mores of the 1950s strictly forbade placing both sexes in the same hospital room—males and females were usually assigned to separate wards or to same-gender semiprivate rooms. Although both sexes lay side by side in the recovery room, the issue never arose because the trustees assumed that these patients were still "asleep" under the influence of anesthesia. McClenahan deftly deflected this criticism and assured the trustees that "when sex is a problem, the patient does not require intensive care."[51] Although one problem had been solved, economics continued to concern the trustees, who still failed to accept the proposal.

Despite the continued lack of approval by the board, the administrator moved ahead with plans for an intensive care unit and hired nurses

48. J. Don Miller to E. A. Van Steenwyck, 26 April 1954, file marked "intensive care," CHH.

49. Associated Hospital Services administered the local Blue Cross Blue Shield Plan, more commonly known as "Intercounty."

50. Miller interview (n. 20); J. Don Miller to E. A. Van Steenwyck, 29 April 1954, CHH; Fairman and Lynaugh, *Critical Care Nursing* (n. 4), pp 76–77.

51. McClenahan, *G.P.* (n. 29), p. 114. This problem occurred in other units; see Cadmus, "Special Care" (n. 8), p. 64, for example.

chosen by the director of nursing. Miller probably could not have taken this action in a larger hospital with more formal lines of authority and less social cross-over between trustees, administrators, and physicians, because it would have been too politically risky for him.[52] He had, however, a well-placed ally in the president of the board of trustees, T. Morris Perot 3d, who also believed in the idea. Perot quietly assisted Miller as he prepared to open the intensive care unit and agreed to defend him before the board.

The unit opened on an experimental basis on 19 May 1954, still without board approval. At the next trustee meeting, Perot took full responsibility for the "backdoor" maneuvering, noting that "the Board had expressed on many occasions its desire to improve by every practical means the standards of patient care, and realizing that every day of postponement is depriving an average of six patients of this improved care, the administrator with my knowledge has sought to obtain the properly qualified nurses so that the plan could be put in operation as soon as possible."[53] Once the unit was initiated, there would be no turning back.

The First Generation

The intensive care unit consisted of six beds separated by cubicle curtains in Children's Ward, room 225, allowing easy observation of all patients.[54] The administrator chose this particular space to house the unit because extensive renovations were not needed and the pediatric census was chronically low, thereby building in a financial safety net if the intensive care unit was not as well utilized as anticipated. Beery estimated that one to two nurses, an aide, and student nurses would adequately staff the area during the day and evening. One nurse, an occasional aide, and students were assigned to the unit at night.

Beery did not anticipate that the work environment or work patterns would be different from those encountered by staff or private-duty nurses on traditional hospital floors, and therefore formal training courses were not planned. But the nurses who were chosen to work in the new unit quickly learned that caring for a group of critically ill patients required

52. For a discussion of the social cross-over of administrators, physicians, and trustees, see Burling, Lentz, and Wilson, *Give and Take* (n. 17), pp. 59–64.

53. T. Morris Perot 3d to the Board of Trustees, memorandum, 7 June 1954, CHH.

54. Room 225 was called the acute room or critical ward until Laura Mae Beery changed the name to the Special Services Area in 1957 because she felt the original name frightened patients and families: Beery interview (n. 47); Maureen Hamilton, interview, 22 January 1991, Chestnut Hill, Pa. It became the Intensive Care Area around 1959.

different kinds of knowledge and skills from those usually taught in nurse training schools. Nursing education during this time period was functionally oriented and rule-based, and in many schools, nurses were taught to regard a patient as the object of procedures rather than as someone with changing physical and emotional needs.[55] Critically ill patients needed nurses who could evaluate rapidly changing physical signs and symptoms, think critically about their findings based upon experience and theoretical constructs drawn from the physical and social sciences, and, in the absence of physicians, act upon their decisions. Because nursing schools did not provide their graduates with this kind of knowledge, critical thinking skills could be learned only through experience or from physicians, for whom this way of thinking was foundational. "I learned from being in the unit," one nurse remembered, "asking questions and working with physicians."[56]

The nurses' development of new skills was facilitated by the lower patient load and a more consistent physician presence. The process and results of nursing care were made visible to physicians as they watched nurses change dressings, and assess or talk to patients—rather than getting secondhand reports through supervisors or nursing notes. "If you only had two patients that you're totally responsible for," one nurse remarked, "you know what their lab values are, you know what their temp is, you know what their blood pressure is without having to pull a paper out of your pocket, and saying 'I don't know.' . . . I think because you had information up front for them [physicians], I think they kinda felt that you knew what was going on."[57] Greater physician presence also gave nurses and patients more support during emergencies; when a patient hemorrhaged or experienced respiratory distress, physicians and nurses responded together, faster.

Concentrated care, the ability to observe patients, and, later, the unanticipated benefits of greater physician presence and a progressive development of nursing skills constituted the essential components of intensive care; the unit was not designed to complement new or complex machinery, or to offer particular new medical therapeutics. In fact, Chestnut Hill Hospital's unit stocked few pieces of equipment except for oxygen tanks, a supply of emergency drugs such as Levophed, Coramine,

55. For a discussion of nursing education during this time, see Julie Fairman, "Thinking About Patients," *Reflections,* 1997, *23:* 30–32.

56. Regina Bradley, interview, 31 January 1991, Chestnut Hill Hospital, Chestnut Hill, Pa. The learning process is described in Fairman, "Watchful Vigilance" (n. 43). The changing nursing knowledge is described by Fairman in "Thinking About Patients" (n. 55), pp. 30–33.

57. Bradley, interview (n. 56).

and Digalen,[58] dressing trays, and supplies for intravenous therapy, but these supplies were similar to those found on the general floors. Emergency equipment such as the resuscitator and cardiac massage tray were located nearby in the operating room, rather than in the intensive care unit. Routine equipment such as Wangensteen suction bottles and bladder-drainage supplies were not stored in quantity in the intensive care unit but had to be ordered from Central Supply; an orderly was assigned to run for items needed during emergencies.[59] The hospital did not envision the unit as a highly technical area—it reflected very simple concepts. The need for space for larger equipment such as monitors or Wangensteen suction bottles was not anticipated nor incorporated into the plan. There really was no room for machinery: some beds were less than two feet apart and barely allowed a nurse or physician to maneuver.

Into this intimate, "low-tech" area came both medical and surgical patients without regard to age or diagnosis, although most physiologically unstable patients at Chestnut Hill Hospital usually had medical (rather than surgical) problems. Physicians admitted patients suffering from heart attacks, hypertension, pulmonary edema and asthma, mild trauma, and burns, and surgical patients with complications, to the unit during the first few years.[60] The unit at first served primarily the elderly and the chronically ill suffering from mild exacerbations. At Chestnut Hill Hospital, more than 60 percent of medical and surgical patients were over sixty-five years of age, in contrast to 22 percent of the population at an inner-city teaching hospital such as the Hospital of the University of Pennsylvania.[61] Major surgical cases at Chestnut Hill in the 1950s were those that required general anesthesia but were not necessarily particularly complicated. Physicians at the hospital did not perform cardiac surgery, large-scale cancer resections, or long neurosurgical procedures. Most surgical patients left the operating room in fairly stable condition and did not need intensive nursing care after their stay in the recovery room.

58. These drugs helped maintain blood pressure and heart contractility.

59. Nursing Service, "Special Service Unit," 11 May 1954, CHH.

60. Miller, "Critical Care Unit" (n. 8), pp. 46–47, 96; Ruth Jarousse, telephone interview, 1 February 1992; Emergency Equipment Committee (ad hoc), "Emergency Facilities of Chestnut Hill Hospital," 3 March 1961, CHH.

61. Administrator's Report, Board of Trustees, minutes, 27 October 1953, CHH; HUP figures are for patients sixty years or older: Annual Report of the Board of Managers, Hospital of the University of Pennsylvania, 1965–66. The HUP figures are admittedly from ten years later—but that makes the population age difference even more significant, because of the increasing number of elderly patients in the nation's hospitals; see Fairman

The intensive care unit began as a quiet experiment but proved an immediate, loudly acclaimed success that overwhelmed the rudimentary planning and facilities. After the first week of operation, the unit remained full and extremely busy.[62] Van Steenwyck's fears about the popularity of the idea were borne out: administrators at other Philadelphia hospitals soon learned about Chestnut Hill's negotiations with Blue Cross, primarily through physicians who practiced at multiple hospitals, and wanted the same considerations. Group nursing financed by families, and eventually by private insurers, became routine.

The Second Generation: Lessons Unlearned

As the hospital expanded and the number of patients with more-complex illnesses increased throughout the late 1950s, Miller realized that the hospital needed more intensive-care beds. This time, the trustees offered no resistance to the expense of a new and larger intensive care unit.[63] The second-generation unit (also known as Room 236) opened in 1960 in a former operating-room area and contained five beds in each of two rooms and three beds in an adjoining alcove. This unit also contained relatively few technological innovations, except for one "wall" suction and oxygen outlet per patient and a pneumatic-tube delivery system.[64] There were no advanced cardiac monitors, such as the newly available models with continuous printout capacity or pulse-rate alarm

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and Lynaugh, *Critical Care Nursing* (n. 4), chap. 2. HUP's location in a poor urban community may also have contributed to the difference, but much of the local indigent population may have been served by the city hospital (Philadelphia General Hospital) next door.

62. The intensive care unit generated a net income of about $800 per month from the group-nursing fees, making the expense of concentrated nursing care easier for the board of trustees to accept—as did the effectiveness of the unit as a public relations tool; see Miller, "Critical Care Unit" (n. 8), p. 47. According to Miller, representatives from more than two hundred hospitals, including some from larger or university-based institutions such as the Mayo Clinic in Rochester, Minn., and the Virginia Medical College at Richmond, Va., visited Chestnut Hill Hospital in the first few years of operation and used the unit as a model for larger, more sophisticated versions: Miller interview (n. 20); Administrator's Report, Board of Trustees, minutes, 17 December 1957, CHH; J. Don Miller, "An Early Intensive Care Unit," unpublished MS, 1979, p. 6.

63. The new unit cost approximately $50,000, of which $20,000 was provided by the Ladies Auxiliary. The rest was painfully raised, after a recent major fund-raiser from private sources, or taken from the hospital's endowment fund.

64. The pneumatic-tube system consisted of a series of pathways that propelled small capsule-like containers carrying small objects such as blood samples or medications, or messages: Colin W. Clipson and Joseph J. Wehrer, *Planning for Cardiac Care: A Guide to the Planning and Design of Cardiac Care Facilities* (Ann Arbor, Mich: Health Administration Press, 1973), p. 224.

setting, but that was probably not unusual for intensive care units in small hospitals because of the cost.[65] By 1960, the hospital had a total of one "prototype" monitor and one AC defibrillator outside the operating room.[66]

Two key concepts—easy observation of patients by nurses, and concentrated nursing care—were not consistently applied in the second intensive care unit. For example, the nurses could not see the patients in the three alcove beds outside the main unit; although they tried to place less-acute patients in the alcove beds, this was not always possible. And, although day staffing was adequate to compensate for the time required to keep watch over the alcove patients, other shifts were less amply supported. Six or seven permanent professional nurses were assigned to the day shift, while only two were usually assigned to the evening shift and the night shift. The night shift, one report later noted, "is numerically and qualitatively poor."[67] The director of nursing fell back on traditional low-cost methods of supporting short staffing by hiring less-skilled aides and practical nurses, using "p.r.n." nurses, or "pulling" nurses from other units. Although these strategies numerically increased the staff, they diluted the skills of the few expert nurses present. Unskilled temporary workers could not accurately assess the changing status of patients or make independent decisions about their care. In turn, intensive care unit nurses spent a great deal of time supervising less-skilled, temporary workers, an experience similar to that of general floor nurses during the 1950s as hospitals hired less-skilled workers to overcome nursing shortages.[68]

65. For example, Community Hospital of Battle Creek, Mich., a hospital of similar size to CHH, did not have monitors in the intensive care unit: W. K. Kellogg Foundation, *The Planning and Operation of an Intensive Care Unit: An Experience Brochure* (Battle Creek, Mich.: self-published, 1961), p. 26. By 1956, Paul M. Zoll, Arthur J. Linenthal, Leona R. Norman, Milton H. Paul, and William Gibson had devised a cardiac monitor with an audible heartbeat signal, continuous printout capability, and rate-change alarms: "Treatment of Unexpected Cardiac Arrest by External Electric Stimulation of the Heart," *New England J. Med.,* 1956, *254:* 541–46.

66. The description of the hospital's monitor capability was provided by Clifford Loew, interview, 28 January 1991, Chestnut Hill, Pa. In 1964, the hospital bought the intensive care unit a crash cart with a console monitor, a DC defibrillator, a heart-rate meter, and a free-standing cardiac monitor: J. Don Miller to the Emergency Equipment Commitee, memorandum, 2 October 1964, CHH.

67. Intensive Care Committee, "Some Problems and Proposed Solutions Regarding Care in the Intensive Care Unit," 1 March 1974, CHH.

68. See Fairman and Lynaugh, *Critical Care Nursing* (n. 4), chap. 3.

In addition to adequate staffing and the ability to observe patients, space became a critical concept. The hospital still packed as many beds as possible into space formerly accommodating two operating rooms and storage closets. Only twenty-four inches of space separated some of the beds, and one particular pair of beds was only eighteen inches apart.[69] One report described the difficulties presented by the cramped quarters: "patients are resuscitated and live or die while witnessed by three or four other critically ill patients only a few feet away."[70]

By the 1960s, intensive care at the hospital had become a "runaway" idea: it had taken on a meaning and purpose not originally anticipated, and created new sets of problems. Because of its larger size, the new intensive care unit took pressure off the understaffed nursing shifts on the general floors by removing the patients who required greater nursing attention, unofficially provided a "reserve" area for paying patients when the rest of the hospital was full, and provided relief to physicians fearful for their unstable patients in the absence of interns and residents. On the other hand, allowing the unit to take on these functions created political and personal conflicts between physicians over the control of patient admissions, overcrowding, and stress for the patients temporarily placed there.[71]

Intensive care began simply as greater-intensity nursing care and better patient observation than were found on the general floors. Although an elegant, elementary concept, it was outdated almost from the start. As nurses gained experience in intensive care units, they became unexpected and prized specialists skilled in the care of physiologically unstable patients.[72] The nurses also became adept at managing the machines and adapting equipment to meet their patients' needs. The intensive care unit, despite the chaos of the environment and the inherent instability of the patients, became the "safe" place for patients who required equipment for survival. The environment created by the combi-

69. Closeness of beds does not appear unusual in the early intensive care units: see the photographs in Paul Safar, T. J. Dekornfeld, J. W. Pearson, and J. S. Redding, "The Intensive Care Unit," *Anesthesia,* 1961, *16:* 275–84; and J. Murray Beardsley, J. Robert Brown, and Carmine J. Capalbo, "Centralized Treatment for Seriously Ill Surgical Patients," *JAMA,* 1958, *162:* 544–47.

70. Intensive Care Committee, "Some Problems" (n. 67).

71. Intensive Care Committee, minutes, 21 May 1968, CHH.

72. The concept of specialized nurses expanded in the early 1960s. Chestnut Hill Hospital employed a "tonsil nurse" to provide support and education to families and children after tonsillectomies: Nursing Committee, Board of Trustees, 27 February 1962, CHH. In 1965, the department of nursing service at HUP organized an orthopedic nurse consultant service consisting of two nurses with "specialized skills": Department of Nursing

nation of clinical expertise and equipment mastery may, in fact, have made possible the later introduction of complicated technology into the intensive care units, and contributed to the perception of these units as places for "high-tech" care. As the ideology of intensive care changed from its simple origins, the combined skilled nursing care, space, and equipment became scarce resources to be used only by those who potentially benefited from them—unless the hospitals lacked beds for patients who could pay.

The population of those who were permitted to benefit from intensive care also changed according to economics, the possibilities of medical therapeutics, and socially constructed expectations of medical care. After closed cardiac massage and the portable DC defibrillator made "out of the operating room" resuscitation practical and possible in the late 1950s and early 1960s, broad, subjective frameworks of salvageability were introduced and layered upon socially constructed categories of who was worth salvaging. Later, criteria determining brain death were added to the framework.[73] Following Claude Beck and David Leighninger's concern over hearts "too good to die,"[74] cardiologists Clifford Loew and Mary Livezey proposed a cardiac monitoring unit at Chestnut Hill Hospital in 1963, noting that "a great number of those who would benefit from such a unit were in the 40 to 60 age group."[75]

When the intensive care unit first opened in 1954, "all patients in need of constant nursing care and supervision" not available on the general floors were candidates for admission.[76] By 1958, however, terminal, "geriatric," and emotionally disturbed patients were no longer considered appropriate candidates for intensive-care admission, in part due to newly established criteria defining salvageability and worthiness.[77] By the mid- to late 1960s, these patients were more common residents in the unit

Service, "Announcement, Orthopedic Nurse Consultant Service," dated 1965, CFSHN. See also M. Jay Croley, "What Does a Psychiatric Nursing Specialist Do?" *Amer. J. Nursing,* 1962, *62:* 72–74; Fairman and Lynaugh, *Critical Care Nursing* (n. 4), chap. 5.

73. For descriptions of these medical advances, see William B. Kouwenhoven, Dr. Ing, James R. Jude, and Guy G. Knickerbocker, "Closed Chest Cardiac Massage," *JAMA,* 1960, *173:* 1064–67; Zoll et al., "Treatment of Unexpected Cardiac Arrest" (n. 65), pp. 541–46. See also the Report of the Ad Hoc Committee of the Harvard Medical School to Examine the Definition of Brain Death, "A Definition of Irreversible Coma," *JAMA,* 1968, *205:* 85–88.

74. Claude S. Beck and David S. Leighninger, "Death after a Clean Bill of Health: So-Called 'Fatal' Heart Attacks and Treatment with Resuscitation Techniques," *JAMA,* 1960, *174:* 117–19, quotation on p. 118.

75. Mary M. Livezey and Clifford Loew to Members of the Woodward Fund Committee, memorandum, 16 August 1963, CHH.

76. Department of Nursing Service, "Special Services Unit," 11 May 1954, CHH.

77. "Critical Patient Area Project," unpublished report, March 1958, CHH (unpaginated).

because the elderly population in hospitals in general was increasing and, since people with chronic diseases were living longer, they required more care than could be provided on the general units.[78] "Medicare is beginning to grow on the general population," the intensive care unit committee noted in 1968, "and many non-resuscitable, terminal senior citizens' families—and in turn their physicians—are requesting and in some cases demanding admission to the hospital. More are dying in the ICU and fewer at home."[79]

By the late 1960s, the hospital's criteria for salvageability, and indirectly for admission to the unit, had not become more specific—but the list of those who *should not* use intensive care resources was growing and taking on a particularly socially defined flavor rather than a machine-generated, deterministic direction. In 1966, the chairperson of the intensive care unit noted that "the intensive care unit should *not* include terminal cases or long-term care of such cases as strokes, craniotomies, debility or chronic alcoholism, especially when the patient is *not* on resuscitative measures."[80] Later, the hospital also made the decision not to use scarce cardiac monitors with patients for whom no resuscitation measures were planned.[81]

Medical therapeutics were changing rapidly, making criteria obsolete almost as soon as they were written. The hospital, in turn, capitalized on the fluidity by using the area as a "buffer" or overflow zone for semiprivate patients, despite a typically high census in the intensive care unit. In the late 1960s the hospital still had a long semiprivate-bed waiting list, and temporarily empty intensive-care-unit beds were tempting outlets for the patient overflow. At times, a patient awaiting routine surgery such as a herniorrhaphy was assigned a bed next to a newly operated patient. The intensive care committee noted that admissions were occasionally "grossly inappropriate, and that recently, a 27 year old girl was admitted

78. For a discussion of the growing elderly hospital population, see Klarman, *Economics of Health* (n. 22), p. 39. The growth in the elderly population in hospitals may have been due to indigent, aged patients covered by the Kerr-Mills legislation of 1960. Rosemary Stevens, *In Sickness and in Wealth: American Hospitals in the Twentieth Century* (New York: Basic Books, 1989), pp. 273–75, discusses the expansion of services for the indigent elderly that occurred under Kerr-Mills. In the same source, she also notes increasing hospital utilization by patients aged sixty-five and older: from 10 admissions per 1000 persons (1921–24) to 134 admissions (1955–57), a 13.4-fold increase (p. 250, table 9.3).

79. Intensive Care Committee, minutes, 21 May 1968, CHH.

80. Amory M. Sammaripa to the Executive Committee, memorandum, 16 December 1966, CHH.

81. Medical Staff, minutes, 27 January 1967, CHH.

to the intensive care unit for the elective removal of a cyst of the mandible. At the same time, admission of a 50-year old man in profound shock due to pulmonary embolus was initially refused."[82]

To the complaints of improper admissions was added the problem of patients who no longer needed the special techniques or skilled nursing care found in the intensive care unit, but who required more care than could be provided on the general floors. Physicians were reluctant to discharge these patients from the intensive care unit only to find them neglected or at risk because of continued inadequate staffing on the general floors. Sometimes they remained in the unit for weeks at a time, taking up space needed by physically unstable patients. "All too frequently," one physician wrote, "when the critical stage is past, patients continue to remain in the unit. At the present time there is one patient who has been in there for over six weeks, but he does not appear to be in critical condition. He stays despite notification to his physician. . . . Such attention as these patients are given deprives those who are seriously ill from receiving full attention of the nurses and thereby defeats the purpose of the intensive care unit."[83] These complaints, when placed in the context of changing ideologies, medical treatment, and definitions of salvageability, contributed to a sense of modulated chaos and an environment of entrepreneurship that characterized the intensive care units during this time, and that continues to do so today.

Conclusion

"Historical accounts frequently associate an important innovation with a specific artifact and with a decisive moment in the work of a heroic inventor."[84] In contrast, the Chestnut Hill story is an interesting example of an innovation that developed without the force of a specific artifact or device. Multiple complex factors such as economics and professional culture provided the milieu that supported intensive-care development. Although much of the recent literature examining the history of technology development is no longer in the deterministic mode or focused on

82. Intensive Care Committee, "Some Problems" (n. 67). The Hospital of the University of Pennsylvania also used their first intensive care unit, Fifth Special, as a buffer for hospital overflow. Theodore Last, "Concentrating on the Critically Ill," *The Modern Hospital,* 1956, *86:* 69–71, noted that Fifth Special routinely admitted preoperative heart-surgery patients to the unit, and discharged 179 patients to home from the intensive care unit in the first nine months of operation.

83. Louis A. Pegel to Benjamin D. Parish, 2 April 1962, CHH.

84. Robert G. Arns, "The High-Vacuum X-Ray Tube: Technological Change in Social Context," *Technol. Cult.,* 1997, *38:* 852–90, quotation on p. 890.

the "great inventor," the pendulum has swung perhaps too far in the direction of sociological context, minimizing the importance of the community of local actors and obscuring their influence. In the case of Chestnut Hill Hospital, the social is not entitled: the mesh of local actors within the social context of the times provides, perhaps, a richer story. Three examples are presented by the case. J. Don Miller influenced the process of critical-care development through his active approach to hospital administration and the effectiveness of his decision-making, due partly to his advanced education in hospital management and to his keen sense of the social hierarchy within the hospital. He was trained to run the hospital; he knew how to get things done and obtain the support of a select group of hospital trustees. The trustees were comfortable working with a trained manager because a growing number of them worked in the trustees' corporations. Miller willingly looked outside the immediate hospital hierarchy for solutions—as exemplified by his consultation with a third-party insurer, and by the entrepreneurial manner in which the intensive care unit became a reality.

William McClenahan was a powerful physician who had the attention of the trustees and the administrator through his social connections in the local community and his professional and political liaisons within the hospital. On the other hand, the absence of Laura Mae Beery from formal policy-making situations, but her participation in the informal decision-making centered around the development of intensive care, speaks to her less-visible, although still powerful, influence at the hospital. Beery was not of the same social class as the trustees or physicians, and she lacked the legitimation that Miller gained through his advanced education and, perhaps, his gender. Still, Miller and McClenahan acutely needed her expertise and her cooperation as director of nursing to completely potentiate their ideas.

At Chestnut Hill, intensive care was formulated through a personal, entrepreneurial, and flexible innovation process that probably could not have worked as effectively or quickly without the social melding of physicians, administrators, and trustees that occurred in this small community institution. The intimacy of the institution, along with the particular character of and relationships between the actors placed within the context of the time, enabled Chestnut Hill to organize intensive care earlier than larger, more elite institutions in the city. The purpose of this narrative was not to identify "firsts" (although Miller, the administrator, went to great lengths to publicize Chestnut Hill's intensive care unit as "the first"), but it does illustrate the importance of examining change from different perspectives. In this case, change occurred "from the bottom up," from nonelite institutions to those considered elite, from

grass-roots efforts to national movements. This particular perspective allows us to recognize complexities within a supposedly straightforward narrative.

Because of rapidly changing social and scientific parameters of routine treatment for life-threatening illnesses, there was general lack of consensus at the hospital about what constituted intensive care and who should receive it. These inconsistencies were compounded by continued nursing shortages on the general floors, the hospital's long-standing and continued reluctance to pay for nursing services, and a partisan struggle between the hospital and the medical staff for use of the unit to satisfy their own professional and personal interests. The unit became known as a place where nurses expertly managed machines and patients, a buffer for the hospital's patient overflow and for physicians who did not believe their recovering patients were safe on the general floors. From the void of inconsistency arose a haphazard mix of procedure-oriented policies of exclusion that contributed to the perception of the unit as technologically driven—a far cry from McClenahan's "low-tech" idea of constant nursing attention.[85]

Intensive care reframed the way in which levels of illness were categorized, and itself soon became a technological artifact, a treatment designated as imperative for certain groups of the critically ill.[86] As such an artifact, it could not easily be ignored or denied, despite an early paucity of evidence that it improved patient outcomes. As Barbara Koenig has pointed out, medical imperatives may themselves be socially created.[87] Intensive care held different values and incentives for various participating groups. For physicians, it was a way of reorganizing work, establishing interprofessional dominance, and providing a sense of comfort that someone was watching their critically ill patients. For nurses, learning new ways of thinking about patients and gaining larger clinical responsibilities provided them with greater status and expertise than those who worked on the general floors. The hospital gained an important public device to communicate its significance to the local and professional community. Although it is difficult to extract patients' responses to early

85. McClenahan, *G.P.* (n. 29), pp. 113–14.

86. For the concept of reframing illness, see Charles E. Rosenberg, "Introduction: Framing Disease: Illness, Society, and History," in *Framing Disease: Studies in Cultural History,* ed. Charles E. Rosenberg and Janet Golden (New Brunswick, N.J.: Rutgers University Press, 1992), pp. xiii–xxvi.

87. Barbara A. Koenig, "The Technological Imperative in Medical Practice: The Social Creation of a 'Routine' Treatment," in *Biomedicine Examined,* ed. Margaret Lock and Deborah Gordon (Dordrecht: Kluwer Academic, 1988), pp. 465–96.

intensive care units, one may speculate that the greater presence of both nurses and other critically ill patients presented a mixed blessing of comfort and fear.

Overall, many groups became invested in the success of the intensive care unit for various reasons. Their investment may have helped perpetuate the idea of intensive care as the best possible solution during a tumultuous and critical time. Donald MacKenzie has noted that out of chaos, "order (sometimes) emerges, and its emergence is of course what lends credibility to notions of 'progress.' . . . With hindsight, the technology that succeeds usually does look like the best or most natural next step"; he goes on to ask, "But for whom?"[88] Could there have been other solutions? The hospital could have hired more nurses, or given private-duty nurses greater incentives to care for groups of critically ill patients—but these strategies were not supported by the powerful triad governing the hospital for economic, political, and cultural reasons. Perhaps even these strategies would have quickly become obsolete as patient and technologic complexity overrode the efforts of nurses unprepared to provide intensive care—in any location.

Instead, the hospital, like many others during this time, chose to gather critically ill patients into intensive care units. The institutional response to critically ill patients once scattered around the hospital but now "writ large" in one glaring, obvious, concentrated area created new problems of scale, economics, and ethics far beyond expectations. In fact, the unit became a haven for informally testing new equipment and therapeutics, and indeed may have fostered even more rapid technological change and reinforced its political imperative. As Ruth Schwartz Cowan has noted, "All technological changes have unintended and unexpected social and ethical outcomes, few of which have been predicted by even the best of experts."[89] Perhaps most obviously, few participants realized the irony of inception. Instead of becoming the cost-saving device that Chestnut Hill Hospital intended, intensive care has become the most expensive type of care provided within the American health-care system today.

88. Mackenzie, *Knowing Machines* (n. 5), p. 6.
89. Ruth Schwartz Cowan, *A Social History of American Technology* (New York: Oxford University Press, 1997), p. 326.