Evolution of the ED

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Abstract

Alleviating crowding and minimizing length of stay continue to be major issues in the Emergency Department (ED). However, when intake and flow in the ED are examined, it is clear that the issue is multi-faceted; it will take a combination of improving proximities, changing the care paradigm, and making operational changes to improve the conditions. There have been numerous studies related to operational performance of the ED and the design of the room itself; however, few delve into the issue of the relationship of staff to patient from a design point of view. This study examines ED design from the point of view of staff delivery of care, using several case studies. The case studies represent the evolution of a design concept, where data learned through post-occupancy evaluation was then applied to the subsequent design. What resulted was the "Ribbon" ED concept, which focuses on improving efficiency and flow through a decentralized design that can easily flex based on patient load while minimizing the staff needed to care for patients. The improvement factors achieved in this concept can be combined with other operational and design improvements for other areas of the ED to produce a concept that can be customized to future ED design based upon size and volume targets.

Article

Introduction

Emergency Department (ED) design is driven by maximum volumes to be expected. However, for a significant part of each day, the number of patients presenting is just a fraction of the peak. During these periods, staffing is at a minimum. Generally, volume increases incrementally, and ideally, staffing keeps pace with this change. During low census times, there are frequent occurrences when several more patients arrive than staff has planned for. Many times these patients can be managed by the minimum staff, if they [staff] can visualize the patients in their rooms. However, many ED's are planned in such a way that when an additional patient arrives, a staff member must be added in order to see and care for them. These instances drive up costs of care, as there becomes an inefficient ratio of staff to patient.

Traditional ED's process patients in a linear manner, moving from registration to exam, evaluation, diagnostics/treatment, and admission/discharge. This involves lengthy waits on the part of patients at each point in the process and creates hectic conditions for staff as they move in and out of each room multiple times in uneven cycles based on patients' varying needs.

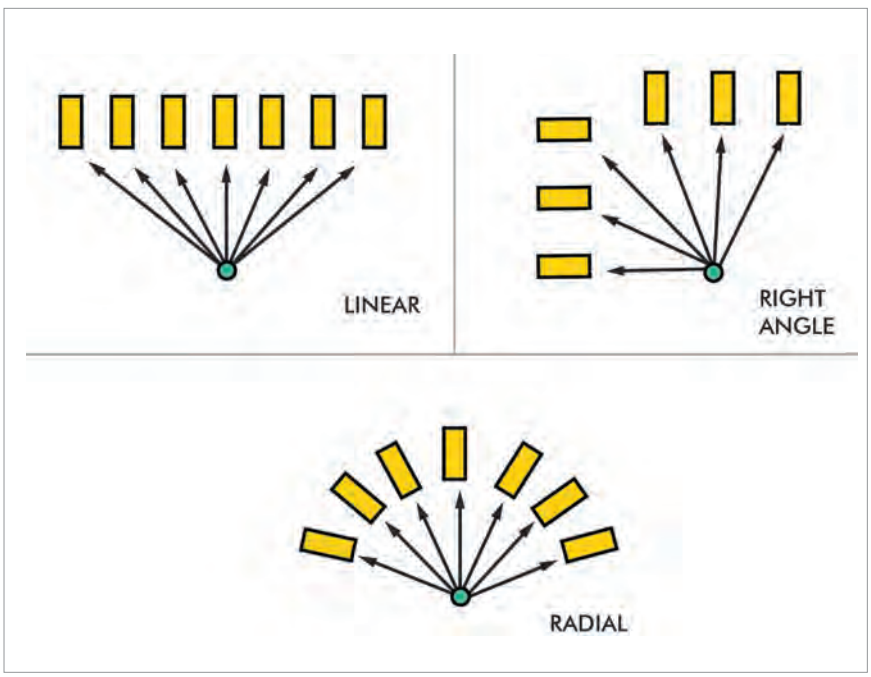

Figure 1: Linear layouts restrict visibility. Creating a right angle can improve on this, but can create awkward spaces. A radial layout allows all rooms to be visualized, and all staff to be proximal with no wasted space.

A number of ideas were introduced into the built environment to remedy this, from zoning the department based on acuity, to attempts to clustering staff in varying relationships with patient rooms, to creating satellite lab, imaging and other diagnostics embedded within the ED. Operational improvements such as bedside registration and triaging of patients directly from the waiting room has shown promise in getting critical patients treatment and eliminating assigning beds to less critical patients.

However, as patient volumes continue to increase, bottlenecks continue to occur because none of these solutions have solved the underlying problem of flow. Flow is influenced by two major factors: the ability to quickly assess, assign and register patients, and the ability to deliver treatment efficiently. This study examines the concept of flow in two parts, front end and back end. Front-end flow studied opportunities to streamline triage and the process registration. Back-end flow looked at a revolutionary new concept for organizing the ED by distributing staff and supplies to reflect the delivery of care model. It has evolved over the course of several consecutive projects, which evolved into the full expression of a new model: the "Ribbon" ED.

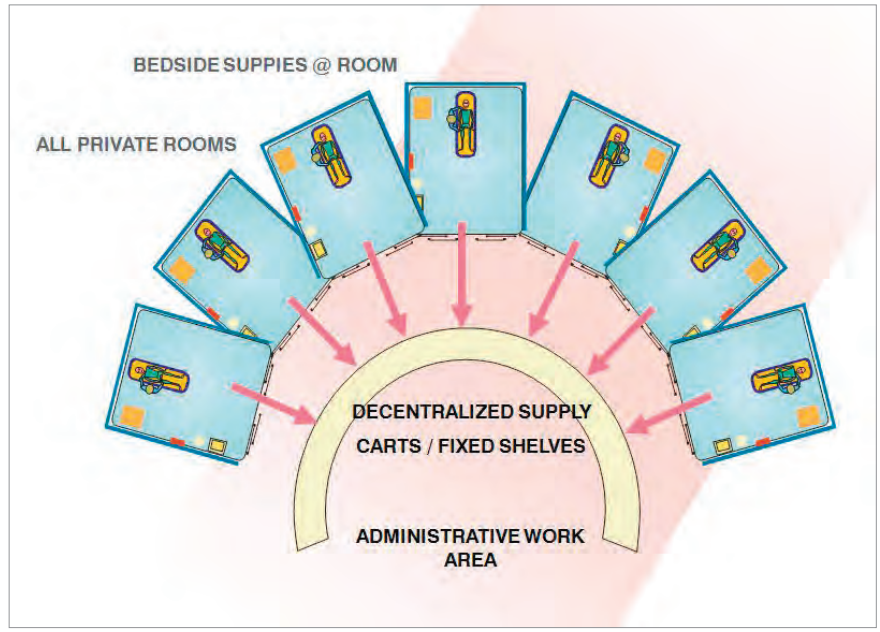

Figure 2: The Ribbon ED builds upon the concept of a radial layout by allowing a decentralized distribution of supplies and equipment.

Design Goals for Improving Staff Care Delivery:

1. Increase capacity of the department to minimize front-end waiting

2. Provide greater efficiency in care delivery to minimize throughput times

3. Increase patient satisfaction by improving the experience and environment

Research Hypothesis

The first bottleneck that occurs in the emergency department is tied to the ability to correctly assess a patient's condition and assign them to the proper area for care. Having every patient wait the same amount of time can lead to dire consequences, just as quickly assigning a patient to a room does not guarantee immediate attention by medical

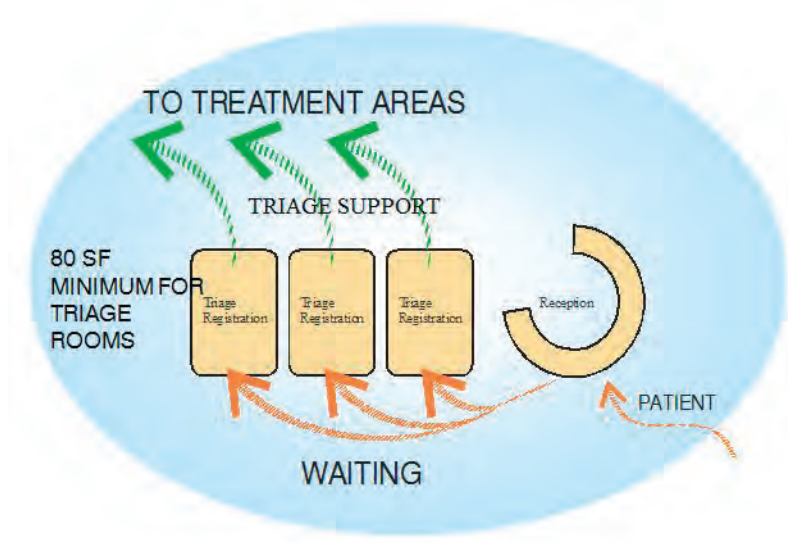

Figure 3: Ideal triage flow.

staff, thus leading to a bed being occupied by a non-critical patient, and further delays in treating other patients. The second bottleneck is related to the first, in terms of being able to efficiently deliver care. This study looked at the effectiveness of triage and in-room registration in correctly getting patients to the proper care setting. It also looked at some of the causes in delay of care related to being able to visualize patients and easily access supplies and equipment from the patient room.

The hypothesis driving the design is that there are four major concepts that impact flow in the ED:

1. Triage of patients directly from the waiting room. Since a majority of ED visits are non-critical, requiring only a quick examination and prescription of drugs or therapy, effective design of the triage space can quickly see and treat patients in the front end of the flow process and avoid them creating congestion in the back end by tying up bed space and additional staff time.

2. Bedside registration can occur immediately prior to or parallel with treatment to avoid delays in either the triage area or exam rooms.

3. Decentralized supplies allow the delivery of care to be more efficient by introducing concepts from Lean design.

4. A radial plan places staff work areas at the center, maximizing visualization of and access to treatment areas while minimizing walking.

Case Studies:
The first test of this theory was at University Hospital in Cincinnati, Ohio. Patients flow from a reception area directly into triage bays which are integrated into the urgent care center. The facility was modeled after research from critical care departments, indicating the importance of decentralized staffing. Designed for 65,000 visits per year, the plan comprises two pods of private exam rooms arrayed radially around a staff work area which accommodates the distributed placement of staff and supplies. The pods are separated by a central urgent care center on one side and trauma area on the other. While this concept did provide an improved patient experience and reduce staff travel around the department, it did not allow for easy flexing from one pod to another during non-peak times.

Designed for 65,000 visits per year, Strong Memorial Hospital in Rochester, NY, improved on the triage and radial decentralized concept. In this model, triage and registration are combined functions. Each treatment zone is organized radially around staff cores. Decentralized supplies are placed along the staff work counter, while restocks and infrequently used items are centralized. Private exam rooms feature bedside supplies with decentralized supply carts and fixed shelves arrayed around the staff work area. This improved upon the previous model, but centralized staff support areas continued to create an obstacle to true flexibility of staffing among pods.

Marymount Hospital, part of the Cleveland Clinic Health System, offered an opportunity to explore the concept further for its 40,000 visits per year ED. Registration/triage were separated from the reception desk and staffed by a pivot nurse. Instead of being placed in detached central pods, staff work areas were clustered in a more amorphous shape that still creates zoning opportunities for the exam rooms but allows centralization of resources for staff and more staffing flexibilities, creating a continuous line of staff work and resources within sight of the patient; the true "Ribbon" concept is born.

This "Ribbon" concept is expressed at the design for University of Pittsburgh Mercy Hospital in Pittsburgh, Pa., where the concept of a supertrack is introduced. The supertrack is an evolution of the fast track concept for processing ESI level 5 patients, and begins to explore the concept of the triage as treatment idea more fully.

Figure 4: Radial layout concept introduced at University Hospital.

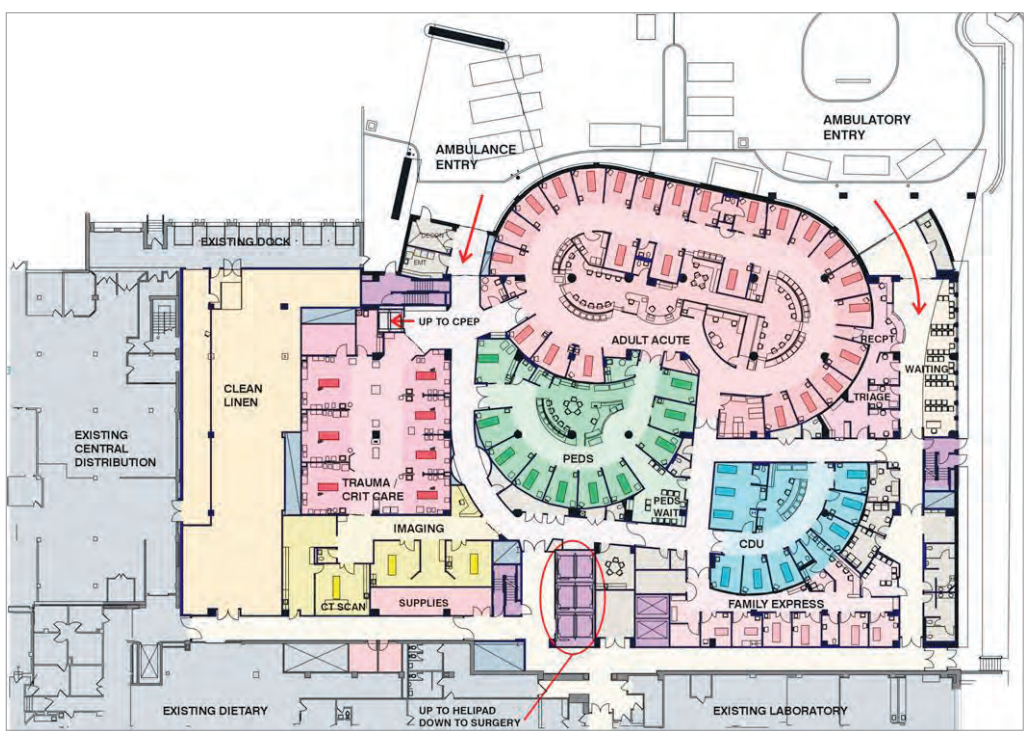

Figure 5: Concept is advanced with triage flow-through and decentralization of supplies.

Figure 6: Ribbon concept is fully expressed at Marymount Hospital.

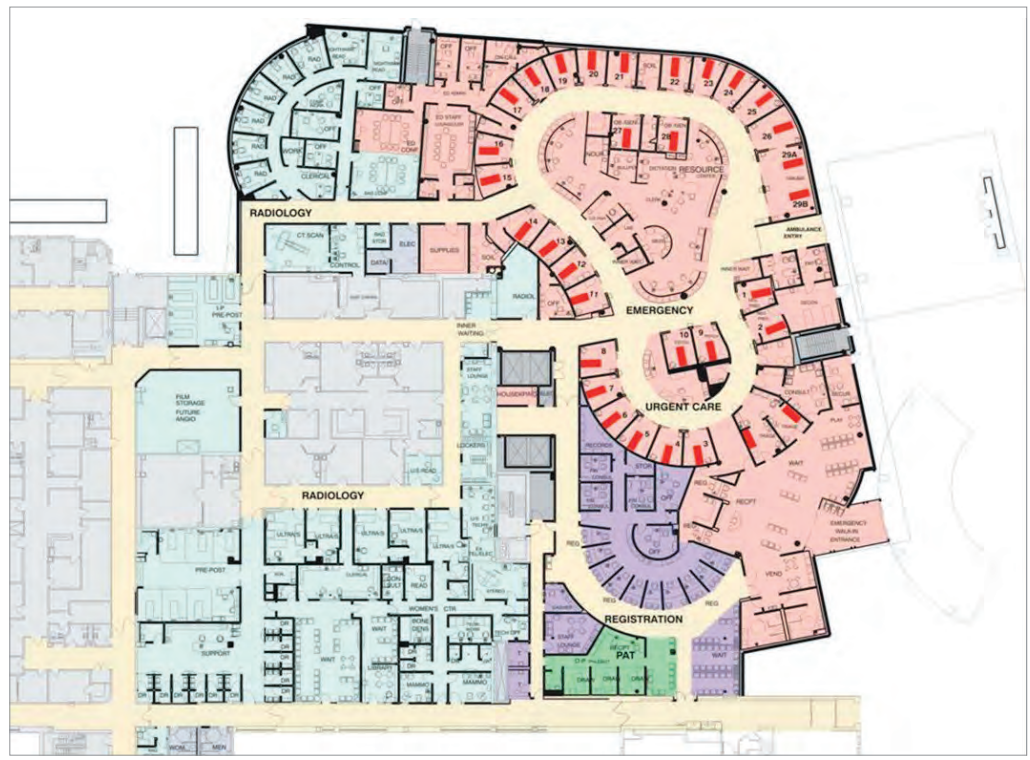

Figure 7: UPMC Advances the Ribbon concept with the supertrack.

Figure 8: The new ED for University Hospitals expands further upon the ribbon concept to function as a high-volume ED.

The most recent expression of the "Ribbon" ED concept is yet to be constructed, but will be an expansion of the original premise at University Hospital in Cincinnati. Designed for an expanded caseload of 100,000 visits per year, this design provides the highest degree of staffing flexibility, featuring double-sided exam rooms that can be staffed by one desk during peak times and another during non-peak times when the rooms are used for overflow.

Conclusion

The concept of a Ribbon ED evolved out of previous models for radial design and decentralization. It focuses on high performance by locating supply carts and equipment in an alcove facing into the corridor designed as part of the front of the nurse work area. The curvilinear design allows rooms to be arrayed in direct line of sight of the nurse work area and allows equipment to be distributed along the path so that it is never more than a few steps away from either staff work areas or the exam rooms. The number of walls that extend to the ceiling were minimized in order to increase visualization through the department and allow staff to zone and flex the space as needed. A supertrack concept keeps fewer ill patients who require more than cursory treatment out of exam rooms in order to keep rooms free for more critical patients and to decrease overall treatment times. The pivot nurse keeps the flow moving.

Operational data supports the "Ribbon" design for the ED. The "Ribbon," or continuous, closed-loop layout of exam rooms can keep operating costs in line by permitting minimal staffing. Decentralization of supplies and support can improve staff efficiency, and therefore improves patient care. Furthermore, open planned ED's promote and maximize visualization throughout, enhancing patient and staff safety.