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REDUCING EMERGENCY DEPARTMENT OVERCROWDING – FIVE PATIENT BUFFER CONCEPTS IN COMPARISON

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ABSTRACT

Emergency Department (ED) overcrowding is a common medical care issue in the United States and other developed nations. One major cause of ED crowding are holding patients waiting in the Emergency Room (ER) for inpatient unit admission where they block critical ED resources. With input data from a hospital in Massachusetts/USA, we tested five patient buffer concepts which aim at relieving pressure of the ER. The buffers are also assumed to improve patient and staff satisfaction through their design tailored to needs in patient flow. To ensure patients safety, we performed tests with discrete event simulation in which we discovered 'triage to bed time' reductions of up to 22% and 'diversion hour' decreases of up to 24%. All buffers managed to run with significantly less resources than the ER. Our findings have a potential impact on hospital process flow due to clear results which offer substantial improvement of hospital organization.

1 INTRODUCTION

1.1 Objective

This study deals with a potential solution for overcrowding in Emergency Departments (EDs) worldwide. The main objective of this study is to improve the hospital environment where human life is consistently at risk. We test if buffers (more efficiently organized waiting periods, where the buffer's staff shields the ER staff from annoying routine matters) in the patient flow can improve hospital organization significantly by using fewer resources. In order not to harm real patients, we apply a discrete event simulation model for testing buffer alternatives.

1.2 Background

Acute illness and traumatic injuries happen at any time. Often an ED is the only source of emergency medical care. Unfortunately, many EDs around the world are crowded on a daily basis (Cowan and Trzeciak 2005; McCaig and Burt 2004). Sometimes an ED stay can last up to eight hours because of ED crowding (Kowalezyk 2007). This problem has been recognized since the early 1990s (Andrulis et al. 1991). Overcrowding has dramatic consequences: although an ambulance with a patient is indeed near a particular hospital, it may have to be diverted to a hospital far away, because the initial ED was full. This is called 'diversion status' of the overcrowded hospital. Frequently, hospitals in an area go on diversion status simultaneously. This leads to higher mortality rates for those diverted patients (Brewer 2002; Richardson 2006).

ED overcrowding is believed to be a systemic problem (Schneider et al. 2001). Overcrowding is commonly perceived as a situation in which there are more patients than staffed treatment beds and waiting times exceed reasonable periods. Crowding typically involves the following patients: those waiting for ED admission, those being monitored in non-treatment areas, and those awaiting transfer to the inpatient unit (IU), which is all the inpatient wards/clinics. Often, the direct consequence of crowding is placing the hospital on diversion status. However, the overcrowding as well as the criteria to go on diversion status are nebulous (Derlet, Richards, and

Kravitz 2001; Jones et al. 2006; Hoot et al. 2007). Thus, we have applied our own real time metric as follows (Kolb, Lee, and Peck 2007). Crowding takes place if both of the following conditions apply:

- 100% Emergency Room (ER) bed utilization and
- Queue length > 50% of ER beds.

Not depending on the size of the ED, this metric represents a combination of resource stress and waiting times.

There are three areas which impact the patient flow in an ED: influx, throughput and outflux. Two of them are in fact independent of the ED.

The influx into the ED has risen, because there are more patients who, growing older, need more emergency medical treatment (McCaig and Burt 2004; Cowan and Trzeciak 2005). At the same time, primarily in the US, EDs are acting as a safety net for uninsured people of all ages (Schull, Kiss, and Szalai 2007).

Concerning throughput, it is difficult to identify the departmental reasons for. However, a number of potential factors have become the focus of research: Among other things Miro et al. (2003) focused on ED-layout to shorten the walking distances and promote communication. The triage and registration are another current focus of research (Bertoty 2007; Subash 2004). Providing diagnostic equipment which the ED owns (blood work, CT, X-Ray) combined with full electronic records has helped to significantly improve testing efficiency over the past decade. Another major ED system improvement has been the introduction of Fast Track, which processes low acuity cases (Garcia 1995; Peck et al. 2008).

With regard to outflux, there is a systematic problem in which patients who need further treatment in a hospital cannot leave the ER because the inpatient ward is not ready to take them. It has been well supported that this effect is a major cause of ED overcrowding. This has been shown qualitatively as well as quantitatively by Schull et al. 2003, Forster et al. 2003, Rathlev et al. 2007, and US GAO 2003.

For the very first time, Kolb, Lee, and Peck (2007) investigated under which specific conditions patient backlog between the ED and IU actually occurs. It was found that backlog is a function of the variable ‘IU utilization’ and the variable ‘coupling between the ED and the IU’. These findings have implications for guiding a hospital’s effort to optimize its system.

Some measures have been suggested to reduce the IU backlog effect.

- Accelerating the admission process between the ER and the IU’s ward (Yancer et al. 2007).
- Using hallways of inpatient wards to place boarding patients (Greene 2007).
- Observation Units, which are units that hold patient with stay times of less than 24 hours, have been implemented successfully, to reduce IU coupling, but the degree of organizational improvement is unclear (Richardson, Dick, and Schneider 2007).

1.3 Structure

This paper consists of five chapters. Number 1 presents the objective and the status quo in research. Chapter 2 focuses on the simulation modeling, the data set and the response variables. In chapter 3 the parameter studies start with the benchmark scenario and are followed by the five buffer studies. Chapter 4 analyzes the most promising concepts in a comparative study. Finally, Chapter 5 presents the conclusions of our work.

2 THE SIMULATION MODEL

This chapter deals with the actual simulation model. For details on the following please see Kolb (2008).

2.1 Conceptual Modeling

The information acquisition at the local hospital, which cannot be named for reasons of confidentiality, is the basis for model building. In order to acquire knowledge about the problem entity, we gathered extensive information at the hospital. We started by observing a particular hospital, located in a U.S. suburban area, one mile away from a highway. This hospital’s ED consisted of 24 adult ER beds, 8 pediatric ER beds, and 4 fast-track beds for minor acuity cases. It had two X-Ray rooms, one CT room, one blood work room, three triage rooms, and two registration rooms. Although, many details of the ED could not be directly observed, these details needed to be understood. Therefore, we extensively interviewed the various staff and managers. By doing so, we learned about ED processes in practice and theory and the critical ED aspects which needed to be part of our simulation.

Figure 1 maps the patient process flow in a ‘conceptual model’ of the ED-IU system. At this macroscopic scale, the ED-IU system is described by two stations with a branching point in between. On a more detailed scale, the system shows influx channels, the front-end (the greeter, waiting area, triage, registration), the fast-track, the adult ER, the pediatric ER, the diagnostic area (X-Ray, CT, blood work), and the IU.

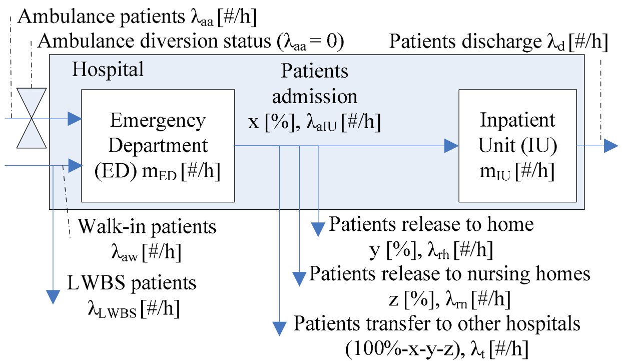

Figure 1: Our conceptual model of the ED–IU system

2.2 Computerized Model

The ED is simulated by a discrete event model which has become increasingly popular for hospital simulation studies in the past decade (Jacobson, Hall, and Swisher 2006). We have deployed the commercial software Rockwell Arena™, which provides input data analyses, advanced visualization as well as scenario analyses (Kelton, Sadowski, and Sturrock 2007).

The focus of our ED-IU model is the logical representation of the hospital organization. Among other aspects, the model is determined by its complex entity flow which reflects the significant real-world flows. Commonly in simulations, the complexity of simulation models is kept manageable by defining submodels (see Figure 2).

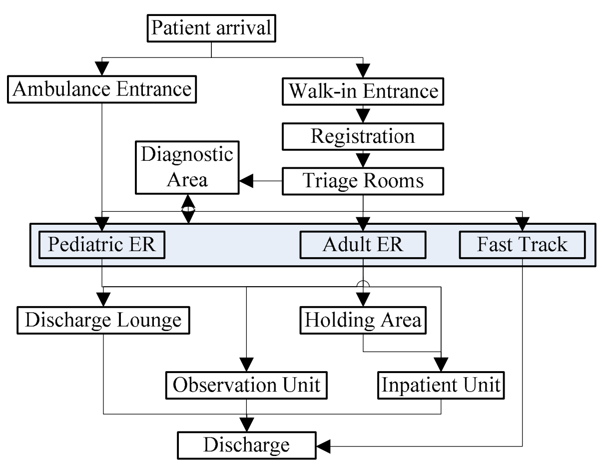

Figure 2: Submodel logic of the computerized model

Validating the simulation model is the key to acquiring reliable study results. We applied the principles of Osman Balci (1995). Furthermore, we followed the modeling and validation process of Robert Sargent (1999) and used the validation tools of Jerry Banks et al. (2005). At the end of our validation process, the simulation model was proved to be sufficiently accurate for our research question.

2.3 Data Set for Simulation Input

Historical data acquisition is crucial, because the results of a simulation are only as good as the input information. In our case, the hospital staff has shared historical data with us, fast answers to our questions, and in depth discussions of our findings. Our partner hospital has been extremely valuable for our research due to it being an 'average' hospital with respect to the following aspects: patient demographics, acuity mix (the mixture of severe and minor medical cases), number of beds, suburban vicinity of hospital, and staffing. Because such a hospital is typical for many countries worldwide, our findings can indeed be applied to hospitals anywhere.

The data in the simulation deals with 8,525 patients, who have been tracked from January 17, 2007 to March 31, 2007. Adult patients account for 69% of the total volume, pediatric patients for 31%. Severely injured patients represent 22%, minor cases account for 29% of the total volume. Monday is the busiest day, Tuesday to Thursday are very similar, Saturday brings significantly more patients and Sunday notably less.

2.4 Response Variables

Comparing the buffers concepts requires consistent key performance indicators (KPIs) for each of them. These indicators are response variables of our model. The KPIs are as follows:

- **Holding patients time** [h/month] represents the mean holding time of all backlog patients in the ER over the two month period.
- **Triage-to-bed time** [min] is the mean time from the patient leaving the triage room to be placed in a bed.
- **Diversion time** [h/month] denotes the cumulative monthly hours during which the ED is on diversion status.
- **Buffer concept utilization** [%] expresses how much patient traffic there is in a given day
- **IU utilization** [%] explains the bed occupancy (e.g. 80% of the beds are taken). In practice, there is no standard way of measuring the IU utilization. Most commonly, it is measured at midnight.
- **Buffer time** [min] is the mean duration from entering the buffer zone until leaving it.

3 PARAMETER STUDIES

Five buffer concepts are presented, tested and evaluated in this chapter. Each concept is tested using one or more scenarios which differ by their opening hours. The overview of all studies and scenarios is shown in Table 1.

Table 1: Overview of the tested scenarios

Buffer concept	Scenario	Name	Regarding
I	**1**	**Holding Area**	A buffer zone between the ED and IU
	2		
	3		
	4		
II	**1**	**ED-Discharge Lounge**	A buffer for patients who wait a long time to be discharged
	2		
	3		
III	**1**	**Observation Unit**	A separate test and treatment unit for <24h patients
IV	**1**	**Holding Area and ED- Discharge Lounge Combination**	The concept referes to all patients, who block beds in the ER
	2		
	3		
	4		
V	**1**	**Holding Area, ED-Discharge Lounge and Observation Unit Combination**	This concept combines concepts I, II and III

3.1 Benchmark Scenario

The benchmark scenario is a status quo simulation of the ED using historical data. This scenario represents the organization of our real ED. The results from this simulation are the benchmark values for comparison with simulated changes to the ED. The results can be found in the top line of Table 2.

3.2 Buffer Concept I: Holding Area

The first buffer concept we examined is the 'Holding Area'. It is can be found in the patient flow between the ED and the connected IU in Figure 3.

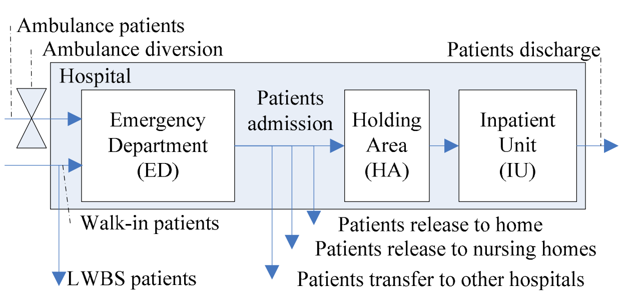

Figure 3: Scheme of Buffer Concept I in the patient flow

Admitted patients frequently spend unproductive time in the ER awaiting physical admission. This is especially a problem during high-volume hours when the ED is pressured to process a large patient load. If the holding patients who block ER beds were in the Holding Area, they would not only free up the ER beds, but they would use fewer hospital resources such as staff and equipment.

In this simulation, we use a buffer zone with 8 beds which provides the necessary privacy for the patients, full telemetry monitoring equipment, and two nurses. The Holding Area needs to be physically close to the ER for the following reasons:

- The traffic flow is managed by the ER.
- The medical responsibility is covered by ER Medical Doctors (MDs).
- Only an ED-managed Holding Area could alleviate pressure from the ED.
- The Holding Area is most efficient, if the responsibility for the patients from ER-Area to Holding Area is not transferred.

3.2.1 Setup

We decided to test four Holding Area scenarios which had different opening hours (see Table 2, Column 2). The 'upper limit' for improvement though a Holding Area buffer is simulated by Scenario I.4 where the area is open for continuous 24-hour treatment. The other scenarios focus on peak hours of treatment.

3.2.2 Results and Discussion

The maximum number of *patients entering the Holding Area* was about one patient every 40 minutes, which occurs roughly between 7pm and midnight. The average *Buffer time* was about 39 min with a variation of +/- 5 min for the scenarios. During all cases the *IU utilization* did not change significantly. This was not surprising, since the average time in the IU is 2.5 days (throughput which is shifted by the ER, does not significantly affect the much slower IU afterwards). The *diversion time* was reduced in all concepts: for Scenario I.1 it is - 5%; Scenario I.2 to I.4 the *diversion time* was reduced by about 13%-14%, which is a major improvement. Similarly, we noted a significant *triage-to-bed time* improvement of 5% to 10% for Scenarios I.1 to I.4, which results from the additional resources for the processing in the ER. The *holding patients time* was considerably affected by the actual Holding Area opening hours: Scenario 1 was 5% better than the benchmark, whereas Scenarios 2 and 3 showed a significant improvement of 20% and 36 %, respectively. This may be caused by late opening of the hospital portrayed in Scenario 1 which was linked to the high influx of minor acuity patients in the afternoon. For some scenarios, the simulation did not reflect the actual *patient holding time*. These study results are presented in detail in Table 2. Scenarios I.2 and I.3 did indeed have a major impact on the ED-IU system and consume fewer hospital resources. Thus, we applied those scenarios for the comparative study of Chapter 4.

3.3 Buffer Concept II: ED-Discharge Lounge

The second buffer concept that was studied is the ED-Discharge Lounge (see Figure 4). Besides patients being admitted to the IU, ER blocking also occurs from the discharged patients, who stay in the ER waiting for their actual discharge. They are the second major blocking cause in the ER. The ED-Discharge Lounge serves as a way to remove these patients from ER to free beds.

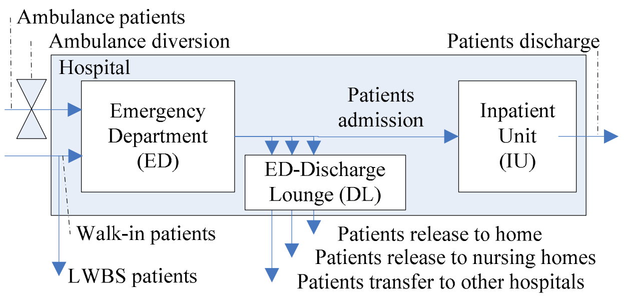

Figure 4: Scheme of Buffer Concept II in the patient flow

There are many different locations that a patient may go after ED treatment. Because they are accompanied by friends or family during their ED stay, some patients leave immediately when they are allowed to. Other patients, however, have to wait for family or friends to pick them up after work. Thus, many hours of ER blockage quickly add up. Another group consists of transfer patients, who have highly variable waiting times to leave the ED, which depend on severity of their illness, availability of transportation to another hospital, and current capacity of the receiving hospital. Patients who are discharged to a nursing home are commonly not picked up until the afternoon, when the daily processes in their nursing home are done, in order to avoid overstretching their own capacities.

3.3.1 Setup

Three ED-Discharge Lounge scenarios are to be tested, one of them is a continuous 24-hours setting which has the disadvantage of pricey 24h staffing (see Table 2). All scenarios will run 5000 times each.

3.3.2 Results and Discussion

For each scenario, the *buffer time* was set at 45.5 minutes (see Table 2). As expected, the *IU utilization* was not affected (set at 87%). By analyzing the *buffer concept utilization*, we noted a decrease of 22% to 18% for Scenario 1 to 3, respectively. This was obviously caused by lower throughput during the additional opening hours. The improvement in *diversion time* of the ED-Discharge Lounge increased considerably from 6% in Scenario II.1 to 14% in Scenario II.3. Similarly, the *triage-to-bed time* increased from about 6% for Scenario II.1 to about 14% for Scenario II.3. Interestingly, *holding patients time* rose from about 2% to 6% for Scenarios 1 to 3. The response variable we used only measures the holding time of admitted patient. As a matter of fact the *holding patients time* therefore increased. With respect to our comparative study, we decided to include Scenario II.2, which used fewer resources than the ER and significantly improved the *diversion hours* and *triage-to-bed time*.

3.4 Buffer Concept III: Observation Unit

Buffer Concept III is conceived for observation patients only, who have an expected hospital stay of less than 24 hours. These patients have to be determined before admitting them, since this implies a different financial billing. Such patients are placed in the Observation Unit instead of the regular IU (see Figure 5).

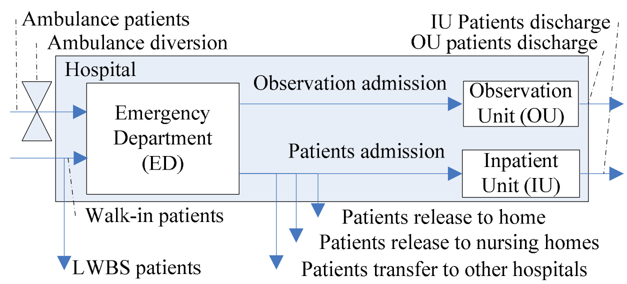

Figure 5: Scheme of Buffer Concept III in the patient flow

The Observation Unit differs from Buffer Concept I and II, because it directly impacts the IU. We suppose that the Observation Unit indirectly reduces ED overcrowding because the stressed IU, which causes a back-up in the ER, eventually becomes relieved by having to handle fewer patients. Moreover, the entire caseload of IU wards is simplified. In Addition, observation patients no longer cause traffic jams along the admission track from the ED to the IU wards. These effects might relieve considerable pressure that had built up in the ED. Similar to Buffer Concepts I and II, the Observation Unit should be supervised by ED management, so that the ED actually benefits from the improvement.

3.4.1 Setup

The Observation Unit is tested exclusively in one 24-hour scenario. The staffing constantly requires one physician assistant, one technician and two nurses.

Comparing the simulated Observation Unit to its real counterpart, we practically simplified our simulation model. Our model does not include operation outpatients, who would probably stay in the Observation Unit as well. This does not affect the results, because the outpatients do not change the demand for the Observation Unit unpredictably.

3.4.2 Results and Discussion

The Observation Unit was capable of reducing the *holding patients time* by 31% (see Table 2). This significantly reduced the backlog between the IU and ED. As a result, the *triage-to-bed time* was reduced by about 4%, whereas the *diversion hours* slightly decreased by 1%. We observed a decrease in *IU utilization* of about 2%, because of the removed observation patients. We found that Scenario III.1 significantly improved the *holding patients time*. Thus, we will use this scenario in the comparative study later.

3.5 Buffer Concept IV: Combination of Holding Area and ED-Discharge Lounge

This buffer concept combines the Holding Area and ED-Discharge Lounge. Patients should leave the ER after the doctors have decided where these patients should go; i.e., whether they should be released, transferred, or admitted. In this concept, all these patients enter the buffer visualized in Figure 6.

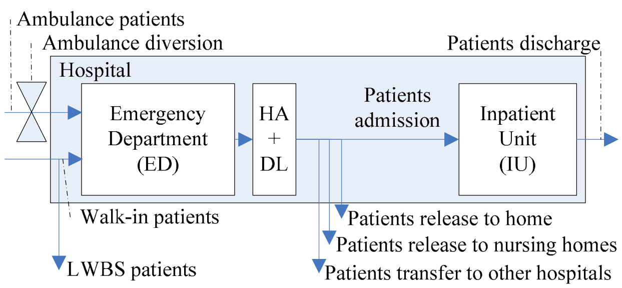

Figure 6: Scheme of Buffer Concept IV in the patient flow

3.5.1 Setup

In this study we examine how the two patient groups – namely the holding patients – share the same buffer resources. These include bed and personnel.

3.5.2 Results and Discussion

The *IU utilization* was fixed for all scenarios (see Table 2). We noted a significantly higher *buffer concept utilization* (34%-43%) than for the concepts I and II. This combination concept reduced the *diversion hours* by about 18% to 24%. The *triage-to-bed time* decreased by about 12%-22%. As expected the *holding patients time* of Concept IV was a mean of the respective values of Concepts I and II. Because of the strong improvement in *diversion hours* and *triage-to-bed time*, Scenarios IV.2 and IV.3 were also selected for the comparative study.

3.6 Buffer Concept V: Combination of Holding Area, ED-Discharge Lounge, and Observation Unit

This combination of Concepts I, II and III represents the idea to implement all possible buffers which release pressure from the ED simultaneously (see Figure 7).

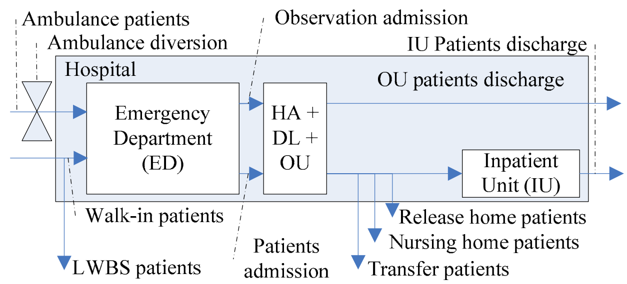

Figure 7: Scheme of Buffer Concept V in the patient flow

With regard to patient throughput this patient buffer concept combines three buffers, i.e., the Holding Area, ED-Discharge Lounge and the Observation Unit, that makes the entire process more complex. In practice, this reflects delays in decision-making and processing times which are not reflected in our simulation.

3.6.1 Setup

Scenario V.1 is the only scenario to be tested, since the observation patients need 24-hour attention. Concerning resources, this study combines the previous studies which continuously deploy two nurses, one physician assistant and one technician.

3.6.2 Results and Discussion

The results showed a 22% improvement in *triage-to-bed* time (see Table 2). The *diversion hours* were strongly reduced by 24%. The *buffer concept utilization* was significantly high at about 44%. Similar to Study III, the *IU utilization* was slightly reduced by 2%. The *buffer time* was longer than that of studies I and II, but significantly shorter than study III. This buffer time denoted many patients who stay in the buffer zone for less than an hour and a few patients who stay for up to 24h. The results of this combination study clearly supported it being used in the in comparative study.

4 COMPARATIVE STUDY OF THE BUFFER CONCEPTS

This chapter examines on the most promising scenarios, which we selected out of studies I to V. We compare the seven scenarios by the three following variables:

- Holding patient time [h/month]
- Triage-to-bed time [min]
- Diversion time [h/month]

4.1 Analysis of Holding Patient Time

Here, we compare the scenarios by using the variable '*holding patients time'* where small values are best. In Figure 8, you can see a significant decrease in *holding patients time* compared to the benchmark (dash dotted line). The ED-Discharge Lounge performed worse than the benchmark, because its improved organization is not reflected in the variable '*holding patients time'*. The increased performance would be reflected in a variable '*ER patients waiting time after disposition'*. We do not use this more general variable, which forces us to take this into account when evaluating the scenarios including the ED-Discharge Lounge. However, the data point for Scenario V.1 is missing since the model did not provide it for Holding Area scenarios with 24-hour opening times. If we tried to place this data point, we could have certainly located it between Scenario IV.3 and III.1, which would implicate an improvement of 11.7% - 31.1%.

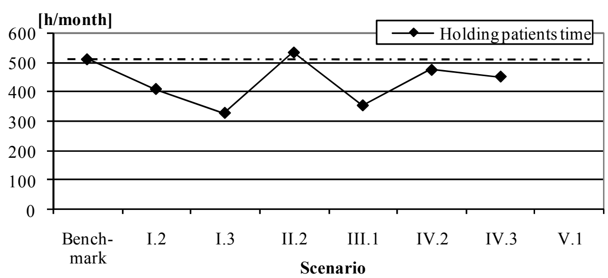

Figure 8: Buffer concept comparison through holding patients time

4.2 Analysis of Triage-to-Bed Time

The *triage-to-bed time* reflects the waiting time of walk-in patients, which in seldom affects patient's health adversely but decrease the patients' satisfaction significantly. Furthermore, this *triage-to-bed time* is subjectively perceived by the patient as a measure of hospital quality. Thus, because hospitals have to compete for satisfied customers, these times are important. The values are presented in Figure 9 with dash dotted lines for the benchmark. The Scenarios IV.2 and IV.3 perform second best with time reductions of 15.1% and 17.5%, respectively. Only Scenario V.1 surpasses them by showing a 21.7% faster *triage-to-bed time*.

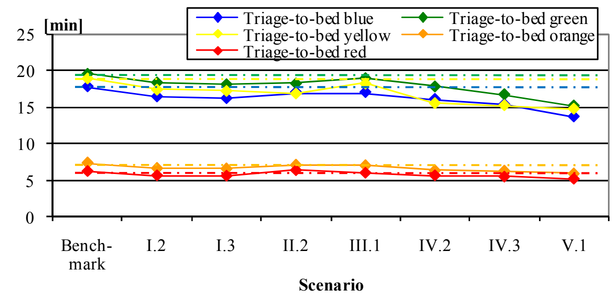

Figure 9: Buffer concept comparison through triage-to-bed time by Emergency Severity Index (ESI) level. The ESI prioritizes emergency medical patients from red (highest), orange, yellow and green to blue (lowest).

4.3 Analysis of Diversion Time

The *diversion time*, during which the hospitals ED is so overcrowded that the ambulance is sent away, may be understood as the most important variable for EDs, due to its impact on emergency medical care. Scenarios I.2, I.3 and II.2 reduce the *diversion time* by about 12.6%, 14.1%, and 8.9%, respectively (see Figure 10). The Buffer Concepts I and II affect the *diversion time* through the same mechanism by reducing the *blocked ER bed hours* and thereby make the ER more efficient. Concept IV shows reductions of 20.3% for Scenario IV.2 and interestingly only 18.3% for Scenario IV.3. Even though the Observation Unit alone minimally decreases the *diversion time* by 0.8%, together as a symbiosis with the ED-Discharge Lounge and the Holding Area, it significantly reduces the *diversion time* by 5%.

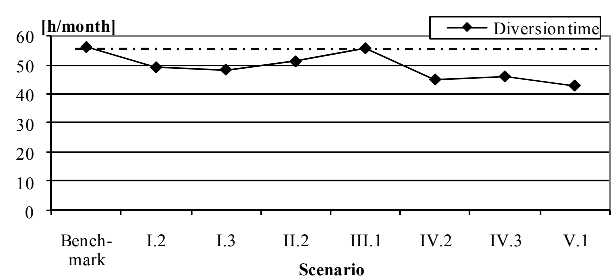

Figure 10: Buffer comparison through diversion time

4.4 Limitations

Similar to any simulation study, there are multiple factors which could compromise our findings. But to test buffer concepts without harming people, simulation is the only method which can be applied. In order to reduce the risk of error, we carefully gathered the model input data as well as the information for the model building itself. We benefited from the average characteristics of our partner hospital, which improves the general applicability of our findings.

5 CONCLUSION AND FUTURE WORK

Testing five buffer concepts in the simulated system, we found that each of them improved the ED-IU system as a whole. The combination buffer concepts IV (Holding Area and ED-Discharge Lounge) as well as V (Holding Area, ED-Discharge Lounge and Observation Unit) were clearly superior to the pure buffer concepts I (Holding Area), II (ED-Discharge Lounge), and III (Observation Unit) for a typical ED. Which buffer to implement, is a decision to be made carefully, since the patient profile and the hospital's surroundings play an important role in selecting the best buffer for each particular case.

Overcrowded EDs with few holding patients should consider an ED-Discharge Lounge (Concept II). Some EDs have to treat a considerably high number of severely ill patients. These hospitals should consider implementing a Holding Area buffer (Concept I). Because of a high number of ED patients who are admitted to an inpatient ward, the flow to the IU has a stronger effect on the system than the discharge and the observational patients.

Outpatient surgery patients take up a significant portion of the work load for some specialized hospitals. In such ED-IU systems, a single Observation Unit could be the best solution. However, these hospitals should also consider the combination Concept V or maybe a combination of Observation Unit with either Holding Area or ED-Discharge Lounge.

For most EDs, a combination buffer concept is appropriate (Concept IV and V). Implementing Concept V makes sense if there is a significant amount of observation patients and/or the billing of inpatient and observation patients varies. Running a Buffer Concept V consumes considerably more resources than a Concept IV. This is mainly due to the 24-hour staffing and its additional administration costs.

Our characterization of buffers in the ED-IU system should be supported by further studies. This could be done though simulations or case studies. If the suggested buffer concepts are frequently utilized in practice, our results could be proved and further supported by real historical data. This would provide EDs with more reliable information when managers think about implementing a buffer.

ACKNOLEDGEMENTS

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A APPENDIX

Table 2: Detailed results of all parameter studies

Buffer concept	Scenario	Buffer opening hours	Holding patients time		Triage-to-bed time		Diversion time		Buffer concept utilization [%]	IU utilization [%]	Buffer time [min]	Simulation runs
			[h/ month]	Improvement [%]	[min]	Improvement [%]	[h/ month]	Improvement [%]				
Benchmark		-	509	0.0	15.8	0.0	56.4	0.0	0.0	87.0	-	5000
I	**1**	5pm-1am	482	-5.3	15.0	-4.9	53.8	-4.7	26.7	86.7	43.9	5000
	2	2pm-3am	407	-20.1	14.6	-7.9	49.3	-12.6	23.6	86.5	40.1	5000
	3	1pm-5am	325	-36.2	14.4	-8.9	48.5	-14.1	21.6	86.5	39.2	5000
	4	24h	-	-	14.2	-10.0	48.7	-13.6	16.8	86.3	34.0	5000
II	**1**	12pm-9pm	521	2.4	14.9	-5.6	52.8	-6.3	21.9	87.1	45.5	5000
	2	10am-3am	533	4.6	14.4	-9.0	51.4	-8.9	20.2	87.2	45.4	5000
	3	24h	539	5.9	13.7	-13.4	48.7	-13.6	17.8	87.2	45.5	5000
III	**1**	24h	351	-31.1	15.2	-3.7	56.0	-0.8	14.1	85.3	0.9	5000
IV	**1**	1pm-1am	599	17.8	13.9	-12.1	46.2	-18.1	42.6	86.7	41.6	5000
	2	12pm-3am	473	-7.2	13.4	-15.1	45.0	-20.3	41.6	86.6	42.5	5000
	3	10am-4am	450	-11.7	13.0	-17.5	46.0	-18.3	39.1	86.5	41.8	5000
	4	24h	-	-	12.4	-21.5	43.0	-23.7	33.8	86.5	41.2	5000
V	**1**	24h	-	-	12.4	-21.7	42.8	-24.1	43.9	84.9	60.3	5000

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