Received March 2007; accepted form January 2008

ORIGINAL

Moving a hospital: Consequences for critical care services

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Abstract. *Introduction:* **Delivering optimal patient care in a three-location hospital during the move to a single new building is complex. Limited information is available in the literature on the medical and nursing implications of moving hospitals, especially for critically ill patients. We assessed the numbers of patients, special equipment and treatments on a regular day versus the day of patient transportation.** *Methods:* **A two time-point survey of in-hospital patients, equipment and treatments on a regular day versus the day of patient transportation in a 525-bed secondary referral centre with 12 ICU beds. Data from all in-hospital patients (wards and ICU) were gathered four months before and on the day of the actual moving of patients. Four days before the hospital move, admissions to general wards were stopped, ICU admission was continued as normal.** *Results:* **The admission stop prior to the move led to a reduction in the number of in-hospital patients (118 patients (day of move) vs. 311 patients (regular day)). On the day of the move significant case-mix differences were observed on comparison with a regular day. Coronary Care patient numbers dropped markedly (2.6% vs. 0%). More patients had to be transported in special beds (8.5% vs. 0.6%). Numbers of ambulant patients and wheelchair patients were reduced (4.2% vs. 21.9% and 11.0% vs. 31.2% respectively). In addition, more patients needed to be accompanied by medical doctors (9.3% vs. 2.9%) and nurses (84.7% vs. 60.5%). The number of DNR-orders was significantly higher than on a regular day (28.9% vs. 10.3%). In the non-ICU environment special treatment frequency (e.g. oxygen therapy and indwelling catheters) did change markedly. In the ICU no decline in treatment intensity was noted.** *Conclusions:* **Physicians making decisions regarding the care of ICU patients during hospital moving should take into account that a hospital-wide admission stop will not lead to important reductions of the numbers of patients to be transported from a mixed ICU. On the other hand on regular wards, case-mix and use of special beds, equipment, and personnel resources may differ markedly from regular days. This may have implications for the planning process and allocation of personnel and budgets.**

Introduction

Moving a hospital requires months of preparation in order to achieve optimal patient care and safety during the complex logistic operation on the day of the actual move [1].

Although papers have been published on timetables, medical supplies and communication during a hospital move, almost no information is available on the differences in medical and nursing care compared with regular days [2-4].

It is a major and complex task to move a 525-bed healthcare facility to a new building whilst continuing to provide services to patients [5]. This was undertaken at Ede's Gelderse Vallei Hospital in September 2000.

Because no data are available on critical care services compared with other hospital services during a hospital move, we decided to assess the numbers of patients, special equipment and treatments on a regular day and compare it with the day of patient transportation to gain insight in the consequences for the critical care services of moving hospitals.

Materials and methods

Gelderse Vallei hospital is a secondary referral and university-affiliated teaching centre in the Netherlands with 625 beds. It was situated at three separate locations in Bennekom, Wageningen and Ede within a distance of 15 kilometres of one another. About 250,000 people are dependent on medical services from our hospital.

On September 26th, 2000, our hospital moved to a new 525-bed facility with 12 Intensive Care Unit beds (ICU) and 10 Coronary Care Unit beds (CCU). The children's department comprises 12 baby incubators, 12 cradles and 21 beds for children.

We assessed the numbers of in-hospital patients, special equipment and treatments on a regular day (May 1st 2000), four months before the hospital move and on the same day of the week as the final move was to take place.

Elective admissions to general wards were stopped five days before the hospital move. During the four days before the actual move, the wards were also closed to emergency patient admissions. During this period other regional hospitals delivered services for new admissions. All admissions to the CCU were stopped 24 hours before the hospital move. Emergency admissions to the ICU were continued as normal until the actual transportation of patients. Elective admissions to the ICU were stopped one day before and the number of ICU beds was reduced to seven, with a maximum of five patients on mechanical ventilation. In the event of capacity problems, patients were transferred to regional hospitals.

The actual transportation was carried out using three different methods. Patients were transported either by taxis, or in groups in coaches. The most severely ill patients were transported in specially designed trucks. Two mechanical ventilators (Siemens Servo 300A, Solna, Sweden) connected to compressed air and oxygen cylinders were placed in each truck allowing simultaneous transportation

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Table 1. Patient transportation during hospital moving

	Regular day	Day of Patient Transportation	P Value
Number of in-hospital patients			
	311	118	
Type of Bed			
Normal	288 (92.6%)	95 (80.5%)	P<0.001
CCU	8 (2.6%)	0 (0%)	P<0.114
ICU	8 (2.6%)	7 (5.9%)	P<0.136
Do Not Resuscitate Orders Baby Incubator	5 (1.6%)	6 (5.1%)	P<0.079
Other Special Bed*	32 (10.3%)	34 (28.8%)	P<0.001
Companionship during transportation			
Medical Doctor †	9 (2.9%)‡	11 (9.3%)	P<0.005
Registered Nurse §	188 (60.5%)‡	100 (84.7%)	P<0.001
Parent	7 (2.3%)‡	0 (0%)	P<0.198
Other (in groups)	107 (34.4%)‡	7 (5.9%)	P<0.001

* Air-fluidised bed, Circle-bed
† Medical doctor/patient-ratio 1:1
‡ As considered on the 1st of May, 2000 by the responsible medical and nursing staff office
§ Registered nurse/patient-ratio 1:1

Table 2. Special equipment and treatments for non-ICU patients (including CCU patients)

	Regular day	Day of Patient Transportation	P Value
Number of non-ICU patients	303 (97.4%)	111 (94.1%)	P=0.136
IV infuse lock heparin	7 (2.3%)	2 (1.8%)	P=1.00
Volumetric IV pump	33 (10.9%)	9 (8.1%)	P=0.406
Syringe IV pump	57 (18.9%)	16 (14.4%)	P=0.298
Oxygen therapy	39 (12.5%)	10 (8.5%)	P=0.281
Pulse oxymetry	18 (6.0%)	2 (1.8%)	P=0.082
Telemetry	4 (1.3%)	0 (0%)	P=0.578
Multi-lead monitoring	20 (6.6%)	2 (1.8%)	P=0.054
Nasogastric tube	30 (9.6%)	12 (10.8%)	P=0.786
Urinary catheter	61 (19.6%)	21 (18.9%)	P=0.784
Indwelling catheter (non-urinary)	15 (5.0%)	2 (1.8%)	P=0.261
Pleural drain (suction)	2 (0.6%)	0 (0%)	P=1.00
Isolation*	4 (1.3%)	4 (3.4%)	P=0.219
Reversed isolation†	2 (0.7%)	1 (0.8%)	P=1.00
Total Number special measures/patient	0.96	0.73	P<0.001

* Because of a multi-resistant gram negative bacteria
† Because of leucopenia

of two patients. Regular resuscitation materials and defibrillators, vacuum suction systems and ICU medications were also available. Monitoring of ICU patients was performed using so-called Pick & Go monitors (Siemens SC 9000 XL, Danvers, Massachusetts, USA) attached to the ICU bed. No ambulances were used. The actual transportation of a patient to the truck portal is depicted in Figure 1. Patients in bed were elevated to truck level using the truck loading platform (Figure 2). Thereafter, the installation of bed, equipment and connection to the mechanical ventilator was finalized (Figure 3).

Registered nurses accompanied the patients in the taxis and coaches. A medical doctor as well as a registered nurse accompanied the patients that were transported by truck. The two ICU patients were accompanied by an intensivist and two ICU nurses.

A medical and nursing staff officer was appointed to be responsible for every ward. They filled out the forms for every single patient within their ward or department on both study days. They also decided which method of transportation was best for each individual patient and who should accompany them.. Furthermore, they provided information on treatment and equipment in use and Do-not-resuscitate (DNR) orders.

Results are presented as actual numbers and percentages, unless specified otherwise. All statistical analyses were performed using SPSS (version 12.0, Chicago, Ill, USA). Chi-square tests or Fisher's exact tests were used when appropriate. Bonferroni corrections were made for multiple testing. A p-value of <0.05 was considered statistically significant.

Results

The admission stop on general wards four days prior to the actual move led to a reduction of in-hospital patients from 311 patients on a regular day to 118 on the day of the move. Significant case-mix differences were observed on the day of transportation vs. a regular day (Table 1).

All Coronary Care patients were discharged within a time-frame of 24 hours after the admission stop. The number of ICU patients did not change (8 vs. 7, 2.6% vs. 5.9%, p = 0.136).

The methods of transportation were more complex than could be expected from the regular day predictions. More patients had to be transported in hospital beds and fewer patients were allowed to be transported in wheelchairs or ambulant in coaches. Also more patients needed to be accompanied by medical doctors and registered nurses (Table 1).

The numbers of DNR-orders were significantly higher on the day of transportation than on regular days (28.8% vs. 10.3%, p<0.001).

In the non-ICU environment, some reductions in special treatment and equipment use were noted, although none individually reached statistical significance. On the other hand, cumulative numbers of interventions per patient during regular days were significantly higher than during hospital moving (0.96 vs. 0.73 p< 0.001) (Table 2).

In the ICU no decline in treatment intensity (mechanical ventilation, monitoring, catheters, support) was noted (7.25 vs. 7.14 interventions per patient, p= 0.594) (Table 3). Total transportation time of ICU patients was 49:27±6:27 (minutes:seconds).

Discussion

Moving patients from one healthcare facility to another involves much more than changing locations [6]. Planning is necessary and must anticipate in the tiniest detail [7]. The initial planning for the move involves much preparation. Understanding the complexity is essential for success [8]. The best way to solve the logistic problems is to look at each area as a unique entity [9]. Every department has to provide lists with information about the numbers and characteristics of the patients, the procedures and personal resources. It is important to develop a proposed timetable [10,11]. Involving staff in planning the move is crucial and is most beneficial and meaningful at the nursing unit level [12]. Strong leadership is essential [13]. Not only planning but practice will make the perfect move [14,15].

Reducing clinical services where possible is helpful. An analysis of emergency admissions should be done when deciding about the day of moving [16,17]. Elective admissions to our ICU were only discontinued in the 24 hours before the move and emergency admissions continued until the ICU patients were moved, because it was felt to be unethical to transfer critically ill patients to other

hospitals over the course of four days. As a consequence, during the admission stop (four days) on general wards, several patients were still on the ICU. The numbers of ICU patients did not change, whereas a important reduction of the number of ward patients was seen. Several factors contributed to the differences observed. The numbers of CCU patients (with an average length of stay of about 16 hours) dropped markedly after an admission stop of 24 hours. On general wards (with an average length of stay of 10 days) the four day admission stop led to a 60% reduction of the number of admissions. This suggests a relationship between the mean length of stay in a ward and the admission stop period necessary to reach a marked reduction of the occupation rate. The mean length of stay in the ICU in the year of the hospital move was 7.4 days. We estimated that 200 patients would need be moved but in the event, this number was only 118. This may have been caused by patient selection effects. Major surgical procedures were suspended for one week before the hospital move.

In the ICU no reduction in intensity of treatments was noted. In contrast, on the general wards, the numbers of special measures per patient were smaller on the day of the move. It is likely that the hospital staff had attempted to reduce the number of interventions during transportation where possible.

There were significantly higher numbers of DNR orders on the day of hospital move than on a regular day. This higher DNR rate may reflect suboptimal considerations of DNR orders on regular days. Results from other studies addressing DNR orders, have shown that DNR frequency varies markedly among studies and settings and that paying attention to DNR questions plays a pivotal role in the observed frequencies of DNR orders [18-20]. Another explanation for the higher DNR rate could be the awareness of the risks that accompany transportation and the fact that medical and nursing staff may want to prevent resuscitation situations in all patients that would not seem to profit from this intervention.

More patients than expected had to be transported in a hospital bed, while there were fewer patients who were ambulant or in wheelchairs. Awareness of the risks involved and patient safety during transportation may have caused the organizers responsible to be extra cautious when deciding on accompanying medical professionals and methods of transportation. The number of medical professionals required to escort the patients during actual transportation differed from the estimates based on information from the regular day. This was most likely due to extra caution on the part of the organizers.

The success of the move of all in-hospital patients is demonstrated by the fact that no adverse effects on patients were observed and by the lack of negative media attention. Meticulous planning and good communication with staff and stakeholders (other hospitals, general practitioners) all contributed towards this success. This has been shown to be important previously [21].

Our study had several limitations. We accepted the numbers of equipment and interventions stated by the officer responsible for each department and did not verify the actual interventions during the hospital transportations. However, we do not have any indications that the actual data presented do not represent the real data. Moreover, the same officers filled out both questionnaires.

Conclusions

Physicians, nurses and hospital administrators making decisions regarding the care of patients during hospital moving should take into account that a hospital-wide admission stop before patient transportation without emergency admission stop to the ICU will not lead to an important reduction in the number of ICU patients. Also the number of interventions in ICU patients did not decrease

In contrast to this, the admission stop caused a remarkable change of case-mix and use of special beds, equipment, and personnel resources on general wards.

The percentage of do-not-resuscitate orders increased significantly.

Our results may have implications for the planning process and allocation of personnel and budgets of a healthcare facility when hospital moving is necessary.

Abbreviations

ICU	Intensive Care Unit
CCU	Coronary Care Unit
DNR order	Do-not-resuscitate order

Competing interests

The authors declare that they have no competing interests.

Acknowledgements

None.

Key Words: Moving a hospital, intensive care, transportation, critical care services,
planning, logistics, secondary transportation, safety.

Key messages:

- Data on patient care and logistics while moving a hospital are scarce.
- A hospital-wide admission stop, before planned patient transportation, led to marked reductions of in-hospital patient numbers.
- During the hospital move the number of do-not-resuscitate orders increased significantly.
- On general wards, treatment intensity declined after a four-day admission stop.
- In contrast, in the ICU both patient numbers and treatment intensity did not differ significantly from a regular day.

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