The expected effects of an Acute Medical Unit on the amount and type of acute patients admitted to the general medical wards and the experienced workload of nurses

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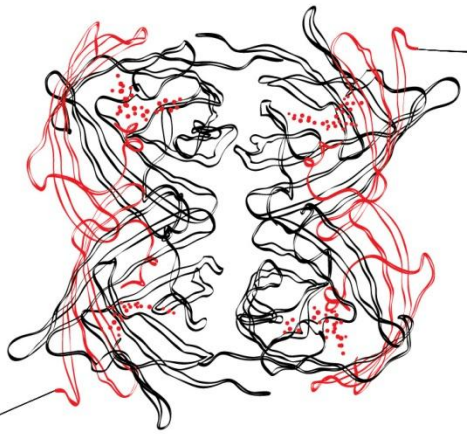
Master's Thesis



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Abstract

Introduction. The establishment of Acute Medical Units (AMUs) in hospitals is growing in popularity as a solution for the problem of bed shortages. An AMU can be seen as a buffer between the emergency department and the general medical wards. Patients can stay for a maximum of 24, 48 or 72 hours at the AMU. Deventer Hospital is currently considering to implement an AMU at their hospital. It wants to stabilize the process of arrival of new acute patients to the medical wards, lower the experienced workload of nurses, shorten the length of hospital stay and reduce the amount of admission stops and patients at a 'second best' or even inappropriate ward. The hospital wants to determine whether this is established by implementing an AMU. This study therefore focused on two expected effects of an AMU: a) a change in the amount and type of acute patients arriving to the general medical wards and b) a lower experienced workload of nurses.

Methods. To analyze the changes in the amount and type of acute patients arriving to the general medical wards, patient data of all acute patients arriving to the emergency department in 2010 were used. Of those acute patients, the patients eligible for an AMU were analyzed. The length of hospital stay per ward and per medical specialty was studied with a statistical program. Those patients with a shorter length of hospital stay of 24, 48 or 72 hours will not go to the wards in case of an AMU. With this information, the amount and type of patients still going to the wards is calculated.

A validated questionnaire, the NASA-TLX, is used to determine the experienced workload of nurses at the wards. The effect of patient type (elective vs. acute) and the effect of ward occupation (average vs. busy) on the experienced workload were measured. The web-based questionnaire was sent via e-mail to all nurses (*N* = 193) of the six general medical wards of Deventer Hospital.

Results. In 2010, 9,098 acute patients were admitted to a department in the hospital after arrival at the emergency department. 5,039 acute patients were eligible for admittance to an AMU of 24, 48 or 72 hours. A total of 18 medical specialties were distinguished in the patient files. Of the 5,039 patients, the medical specialties internal medicine and surgery have the largest amount of admitted acute patients. These two medical specialties both have a relative long length of average hospital stay of respectively 160.2 and 138.0 hours. Medical specialties with fewer admitted acute patients like dermatology, oral surgery and ophthalmology (mostly admitted to E2) are the medical specialties at the general wards that will mostly be affected by implementing an AMU. These specialties have an overall shorter length of hospital stay, which is why fewer patients of these specialties will have to be admitted to one of the general wards. Ward E2 will be the most affected regarding the amount of acute patients and B2 will be the least affected. Between 2 and 13 percent of the total hours of hospital stay at each ward would have been taken away from each general ward when an AMU was implemented at Deventer Hospital. An AMU of 24 beds can be sufficient for the hospital in case of a maximum stay of 24 hours; 34 or 44 beds for an AMU with respectively a maximum stay of 48 hours or 72 hours at the AMU.

The response to the questionnaire was 56.5% (109 nurses). The effect of patient type on the experienced workload was small, but did show a significantly increased workload with the admission of an acute patient (an average Weighted Workload (WWL) score of 48.8) in comparison with an elective patient (average WWL: 44.6). The effect of the ward occupation on the experienced workload was large: a busy ward occupation (average WWL: 76.6) leads to a much higher experienced workload of the nurses, compared to an average ward occupation (average WWL: 48.8).

Conclusion. In conclusion, the changes in the amount and type of acute patients at the general wards and the experienced workload of nurses need to be assessed when considering to implement an AMU at a hospital. The expected effects of an AMU on the amount and type of acute patients arriving at the general wards are that between 2 and 13 percent of the total hours of hospital stay at each ward would have been taken away from each general ward if an AMU was implemented at Deventer Hospital. An AMU will therefore accomplish a considerable change in the hours of hospital stay at the general wards, especially with an AMU of 72 hours. This study also showed that the experienced workload of nurses is mostly dependent on the ward occupation; the effect of patient type on the workload is small. In case of an AMU, unplanned acute patients will no longer arrive at the general wards. The acute patients can be scheduled for transfer to a ward, so they become elective patients in a way. This however will not lead to a considerable lower experienced workload for the nurses.

Outlook. Last, but not least: what does this mean for Deventer Hospital? Analyzing the acute patients admitted to the Deventer Hospital in 2010, which are eligible for an AMU, an AMU of 24 beds can be sufficient for the hospital in case of a maximum stay of 24 hours. With a maximum stay of 48 hours or 72 hours at the AMU, a total amount of respectively 34 or 44 beds can be sufficient for the AMU.

An AMU however, is probably not the solution to lower the experienced workload of nurses at the general wards of Deventer Hospital. Instead, the hospital can focus on better planning of transfers of acute patients from the emergency department to the general wards and a better administration of medication lists to establish a lower experienced workload in general.

1. Introduction

Due to the ageing population, the ongoing development of new medical technologies and the so-called "consumerism", the demand for hospital care is rising[1]. Because of this increasing demand for health care, hospitals are sometimes facing a shortage of beds at the medical admission wards. This can even result in admission stops. A survey among 670 Dutch nurses by the Dutch Consumer Foundation ('Consumentenbond') revealed that 60% of the nurses experience that patients are admitted to an inappropriate medical ward, because the beds at the appropriate ward for their disease are occupied[2]. This can result in a higher experienced workload for the staff at the ward, but also in suboptimal care for the patient, because the nurses at the inappropriate ward are not specialized in the treatment of the specific diseases of those patients[3].

The establishment of Acute Medical Units (AMUs) in hospitals is growing in popularity as a solution for the problem of bed shortages. The goal of an AMU is to raise the bed occupancy of regular wards and increase the quality of care[3]. One expects this special ward to result in less admission stops, less disturbance by acute patients arriving to the general wards and fewer patients at an inappropriate ward[4]. Hospitals use different names for an AMU, like emergency assessment unit, medical assessment and planning unit, rapid assessment medical unit and early assessment medical units[5].

In a systematic review on the effectiveness of AMUs in hospitals[5], the following extensive definition of an AMU is given: "A designated hospital ward specifically staffed and equipped to receive medical inpatient presenting with acute medical illness from emergency departments and/or the community for expedited multidisciplinary and medical specialist assessment, care and treatment for up to a designated period (typically between 24 and 72 hours) prior to discharge or transfer to medical wards". In short, an AMU is thus a clinical admission ward where unscheduled patients with acute medical problems from the emergency department can be admitted for either a maximum of 24, 48 or 72 hours. During the stay at the AMU, diagnosis is determined and treatment is started. Thereafter, the patients will be either discharged or admitted to a medical ward in the hospital. An AMU can thus be seen as a buffer between the emergency department and the general medical wards.

In most AMUs, certain types of patients are not admitted: coronary care unit (CCU) and obstetric patients, children, patients with a stroke and patients with a psychiatric indication[6]. Those patients will be transferred straight to the department specialized in their diseases.

1.1 Effectiveness of Acute Medical Units

In 2009, more than 300 AMUs exist worldwide[5]. A systematic review[5] included nine articles of uncontrolled studies of AMUs. All of these studies were performed in either the United Kingdom or Ireland. Two studies[7,8] reported a reduction in the in-patient mortality after implementation of the AMU and four studies[8,9,10,11] a reduction in the length of hospital stay. No increase in re-admission rates were found in three studies[9,12,13]. Two studies[11,14] reported a significant improvement in patient and staff satisfaction: one of them[11] showed that 52% of the patients, 91% of the nurses and 93% of the medical staff believed the new situation with AMU was better than the old situation. The other study[14] reported that nursing staff had more time for health promotion of patients, but also experienced more stress because of the concentration of acute patients at the AMU. Eight non-peer-reviewed reports of 48 AMUs in the United Kingdom, Ireland and Australia were added to the systematic review. These studies confirmed reductions in the length of stay[5]. The authors of the

review conclude that the evidence of the efficacy of AMUs is limited and that no controlled trials have been reported. Although there are differences in the designs of the reports, there seems to be consistent evidence of the benefit of AMUs in terms of a reduced length of stay and greater patient and staff satisfaction.

Another systematic literature review also reports findings of improved patient satisfaction and reduced length of stay[15]. However, the authors state that certain factors are necessary for an AMU to function efficiently: proactive management, senior staff involvement and also factors like size, location and staffing of the AMU are important[15]. The AMU should be close to diagnostic departments like the laboratory and it should be staffed with senior personnel. However, the number of staff required has not been studied and the recommended size of an AMU could not be predicted from the literature[15].

A comparative research on the performance of AMUs of six Dutch hospitals compared to two Dutch hospitals without an AMU concluded that there are certain positive effects with great differences between the hospitals[16]. The positive effects are either shortening the length of hospital stay, decreasing the time from the emergency department to a ward or an increase in the relative amount of patients at the appropriate ward. Almost all six hospitals with an AMU had faster diagnostics and treatment than before the implementation of the AMU, which can lead to earlier hospital discharge. This has resulted in a decrease in the admittance of acute patients to the wards. No precise figures were published. Disadvantages of an AMU are a possible increase in re-admissions and an increase in patients with a higher intensity of care at the wards[16]. An increase in re-admissions would be a consequence of premature discharge. However, the systematic literature review of Scott et al. did not find any studies which indicated an association of a reduced length of hospital stay with an increased rate of re-admission[5]. Another disadvantage is a possible increase in transfers of patients, for they have to be transferred first from the emergency department to the AMU. After that, they might also need to be transferred to a general medical ward. This can result in a bigger chance of medication errors and miscommunication[3].

According to the Máxima Medical Centre (MMC) in Veldhoven, the Netherlands, an AMU with a maximum length of stay of 24 hours is too short (personal communication, July 18th, 2011). The diagnostics of each patient would mostly not have been finished and therefore an AMU of 24 hours would not accomplish the best effects. MMC Veldhoven has an AMU of 48 hours since September, 2008.

Table 1 summarizes the advantages and disadvantages of an AMU found in literature.

Table 1 Advantages and disadvantages of an AMU in literature

Advantages	*Disadvantages*
Reduction length of hospital stay[5,8,9,10,11,15]	Increase in re-admissions[16]
Improvement in patient and staff satisfaction[11,14,15,16]	Increase in patients with a higher intensity of care at the wards[16]
Increase of patients at the appropriate ward[16]	Increase in transfers of patients[3]
Faster diagnostics and treatment[16]	
Decreasing time from the ED to a ward[16]	
Reduction in-patient mortality[7,8]	
Lower experienced workload of nurses[3]	

1.2 Experienced (subjective) workload

In a literature review about the conceptualisation of nursing workload, nursing workload is defined as "the amount of performance required to carry out those nursing activities in a specified time period"[17]. With an AMU, it is expected that the experienced workload of nurses will be lower, because there are no more unplanned admissions of acute patients to the general wards[3]. A lower workload will result in a higher job satisfaction and can lead to better care for the patient. The workload associated with the arrival of, and care for acute patients is so-called situation-level workload, which measures the impact of different 'situations'. The situational workload is "explained by what happens in a clinical micro system and is temporally bound"[18]. Temporally bound regards to the workload which is assessed either for a specific event or over a short time period: in this case the admission of an acute patient to the ward.

Measures of workload include performance-based, physiological/biochemical and subjective measures[19]. Performance measurement of workload examines how well a person performs a certain task or how their performance gets worse by an increasing workload[20]. Physiological/biochemical measures assume that workload will induce bodily changes, like changes in the heart rate or eye activity[19]. Subjective workload rating scales are currently the primary source of information for workload at the situation level. Subjective measures have some advantages over other measures of workload. Because subjects can give their opinion, the measurements have high acceptance. Also, they are easy to use and can be generalized to new systems or other task conditions, because the unit of measurement is not task dependent[21]. A weakness of subjective measures is the fact that subjects may be biased by their own perception and their current mood and do not remember everything.

In this study, a subjective workload measure will be used, because the physiological and performance-based measures either take certain equipment or take too much time to administer in this study.

Two of the most widely used subjective workload measures are the Subjective Workload Assessment Technique (SWAT) and the National Aeronautics and Space Administration Task Load Index (NASA-TLX). SWAT has three dimensions: mental effort load, time load and psychological stress load. Each dimension has three levels: low, medium and high. The NASA-TLX measures workload on six dimensions: mental demand, physical demand, temporal demand, performance, effort and

frustration level. In this questionnaire, each dimension has a rating scale from low to high (performance is an exception: from good to bad).

1.3 Context

This study takes place in the hospital in Deventer, the Netherlands, in order of the central staff department. Deventer Hospital (in Dutch: 'Deventer Ziekenhuis') is a regional general teaching hospital, which offers broad medical specialty care for residents of Salland and surrounding areas. The hospital is member of the Dutch association for collaborating top clinical teaching hospitals ('Vereniging samenwerkende topklinische opleidingsziekenhuizen'). In 2010, 2,192 persons (1,643 FTE's) were working in the hospital. Deventer Hospital collaborates with different general practitioners and nursing homes[22]. Annually, almost 300,000 patients visit the policlinics and 20,000 patients are admitted to the hospital. The average amount of hospital days for an admitted patient is 4.8 days[22]. The amount of clinical patient days was 101,266 in 2010, of which 533 Alternate Level of Care (ALC) beds. ALC is a clinical designation for patients waiting for a bed at the department specialized in their diseases[23]. Meanwhile, these patients are waiting in a bed at another department, where they thus receive suboptimal care. Deventer Hospital has six general medical wards, each with two or more medical specialties (table 2).

Table 2 Distribution of the medical specialties over the six wards in Deventer Hospital

Medical ward	*Specialties*	*Beds*
A2	Intern endocrinology and intern oncology	39
B2	Nephrology, geriatrics, neurology, dermatology and rheumatology	39
C2	Gastroenterology and surgery (mamma care)	42
D2	Trauma and orthopedics	38
E2	Gynaecology, urology, plastic surgery, ophthalmology and oral surgery	36
G2	Cardiology and respiratory medicine	39

Deventer Hospital also has a department for urgent care (in Dutch: 'Urgente Zorg', UZ), which is somewhat different from acute care. Urgent care is for patients who need treatment within hours at night. There is still time for planning and informing the patient and family about the treatment[24]. In contrast: acute patients need treatment immediately and every minute waiting can increase the chance of complications. At the department for urgent care, the UZ, patients are admitted at night from the emergency department. In the morning, these patients are placed at a general medical ward. The maximum length of stay at the UZ is twelve hours. During the day, no patients are admitted to the UZ. Therefore, beds still need to be available at the general wards in case of new acute admissions. When an AMU will be implemented at the hospital, the UZ will be closed. The patients of the UZ will then be admitted to the general medical wards after visiting the AMU.

1.4 Problem statement

Deventer Hospital is currently considering to implement an AMU. It wants to stabilize the process of arrival of new acute patients to the medical wards, lower the experienced workload of nurses, shorten the length of hospital stay and reduce the amount of admission stops and patients at a 'second best' or even inappropriate ward. The hospital wants to determine whether this is established by implementing an AMU. As mentioned earlier, Deventer Hospital has six medical wards. With the implementation of an AMU, the hospital considers replacing one medical ward by the AMU.

An AMU will have effects on the type of patients at the medical wards. Certain types of patients will be discharged after admission to the AMU and will not be admitted to a general medical ward. Therefore, the type of patients at the wards might change by implementing an AMU in the hospital. Experience of hospitals with an AMU has shown that 50 percent of the patients who arrive at an AMU (of 48 hours) will go home and will not be admitted to a ward[25].

The type of patients that are eventually admitted to a ward might cause changes in the kind of work of nurses: it might occur that mostly patients with a more severe disease will be admitted to a ward because only patients with a longer length of hospital stay than 24, 48 or 72 hours will end up at a general ward[3]. An AMU might thus result in more patients with a higher intensity of care at the wards[16], because only acute patients with a longer duration of stay will be admitted to a ward. Another effect might be less interruption in the normal work processes of nurses. Without an AMU, nurses are often interrupted by acute admissions to the general medical wards[3]. This can lead to a higher (experienced) workload and may eventually even result in a higher risk of making mistakes. With an AMU, the admissions to a ward may become more predictable, because acute patients are first admitted to the AMU. Less interruption of the normal work processes of nurses can therefore result in better quality of care for the patient.

This research studies the expected effects of an AMU on (a) the amount and type of patients admitted to medical wards by giving a description of the current situation and (b) the experienced workload of the nurses at the wards. The main research question is:

What are the expected effects of implementing an Acute Medical Unit on the amount and type of acute patients admitted to the wards and on the workload of nurses at the wards?

To answer the research question, the following sub questions (Q1 – Q6) are answered:

Q1. What is the amount of acute patients admitted to each general ward and medical specialty in 2010? (§2.1; §3.1.2)
Q2. What percentage of the acute patients admitted to each general ward has a longer length of hospital stay than 24, 48 or 72 hours? (§2.1; §3.1.2)
Q3. What changes on the amount and type of acute patients admitted to the wards can be expected by implementing an AMU? (§2.1; §3.1.3)
Q4. What will the AMU and the general wards look like regarding the amount and type of patients after implementation of an AMU? (§2.1; §3.1.3)
Q5. Is there a difference in experienced workload of nurses at the wards between the admission of elective patients and the admission of acute patients? (§2.2; §3.2)
Q6. Is there a difference in experienced workload of nurses at the wards between an average ward occupation and a busy ward occupation? (§2.2; §3.2)

2. Methods

This chapter describes the methods used for studying the expected effects of an AMU on the general wards at Deventer Hospital. §2.1 focuses on the amount and type of acute patients admitted to the general medical wards. §2.2 addresses the current experienced workload of nurses regarding the admission of patients.

2.1 Amount and type of acute patients

By analyzing data extracted from files of Deventer Hospital, the sub questions Q1 to Q4 were answered.

To assess the amount and type of acute patients admitted to the general medical wards, patient files from the electronic health record system were studied. These were obtained from the department of information management at the hospital. This study focuses on acute patients; elective patients were excluded from this study.

First, the amount of acute patients arriving in 2010 was analyzed. This was done for each general medical ward, the UZ and each medical specialty. Secondly, for each general ward and specialty the percentage of acute patients with a longer hospital stay of 24, 48 or 72 hours was calculated. The denominator is thus the total amount of acute patients admitted to that specific general ward and the counter the amount of acute patients with a longer length of hospital stay than either 24, 48 or 72 hours. The length of hospital stay is the difference between the discharge date and the admission date. The admission date and time is set at the moment the patients arrives at the emergency department. The discharge date and time is set at the moment the patient is discharged from the hospital, either when the patient is going home, is transferred to another care institution or when the patient is deceased. The statistical analysis was performed with the program SPSS version 18.

The chi-squared test was performed to determine whether there are real differences between the expected and observed quantities of acute patients per month or per day or that the differences are due to chance[26]. An ANOVA test was also performed to determine whether the averages of length of hospital stay are equal among the six wards and the UZ[26].

Each box plot in this article consists of the minimum, the lower quartile (25^{th} percentile), the median, the upper quartile (75^{th} percentile) and the maximum. In the box plot, two types of outliers are identified by symbols: circles for outliers, and stars for extreme outliers. Outliers are data which lie between 1.5 times and 3.0 times the interquartile range (= 75^{th} percentile minus the 25^{th} percentile) below the lower quartile or above the upper quartile. Extreme outliers are data which lie more than 3.0 times the interquartile range below the lower quartile or above the upper quartile[26].

To assess the changes in the amount and type of acute patients by implementing an AMU at the hospital and what the AMU will look like (Q3 and Q4), the answers of Q1 and Q2 were used. In case of an AMU, acute patients with a shorter length of stay than 24, 48 or 72 hours will be discharged, while a longer length of stay will result in admission to a general ward. Patients of the medical specialties neurology, gynaecology & obstetrics and pediatrics were excluded from this analysis. These patients need specialized care and will be transferred straight to the departments specialized in their conditions (e.g. the stroke unit). Patients admitted to the department for primary care with heart failure (in Dutch: “Eerste Hart Hulp”, EHH), the cardiac care unit (CCU) and the intensive care unit (ICU) were for the same reason excluded from the analysis. With this information, the expected

changes were studied. The patients who currently are admitted to the UZ, were analyzed as if they would go to one of the general wards in case an AMU was implemented at the hospital, for the UZ will close if an AMU is implemented.

Finally, a calculation was made with Excel[a] to analyze the amount of acute patients per day at the AMU for either an AMU of 24, 48 or 72 hours, when it had been implemented at Deventer Hospital in 2010. For each day, the amount of acute patients that would occupy a bed at the AMU was counted.

2.2 Experienced workload

As mentioned in the introduction, the SWAT questionnaire and the NASA-TLX questionnaire are the most widely used subjective measures of workload in general. The SWAT questionnaire requires a card sorting procedure which is time consuming. The total time to administer this instrument can take up to 45 minutes[19] or even 70 minutes[27]. Because the NASA-TLX questionnaire is validated[28], takes less time than SWAT[19], calculates a specific score of experienced workload and gives the possibility to compare different situations, it was used to measure the current experienced workload among nurses at the Deventer Hospital.

The questionnaire (appendix I) used in this study consists of three parts. Part I starts with four background questions, including the sex and age of the nurses, the ward at which the nurses work at the hospital and their type of employment. These background questions are not included in the original NASA-TLX questionnaire.

Part II of the NASA-TLX questionnaire consists of 15 pair wise comparisons between six aspects of workload, namely mental demand, physical demand, temporal demand, performance, effort and frustration level. How many times a nurse has chosen each aspect in the comparisons is counted. This is the weight of that aspect of workload (a value of 0 to 5). The definitions of these aspects are shown in table 3.

[a] In Excel, the following formula is used: “COUNT.IF”.

Table 3 NASA-TLX Rating Scale Definitions[28]

Title	*Endpoints*	*Descriptions*
Mental Demand	Low/High	How much mental and perceptual activity was required (e.g., thinking, deciding, calculating, remembering, looking, searching, etc.)? Was the task easy or demanding, simple or complex, exacting or forgiving?
Physical Demand	Low/High	How much physical activity was required (e.g.. pushing, pulling, turning, controlling, activating, etc.)? Was the task easy or demanding, slow or brisk, slack or strenuous, restful or laborious?
Temporal Demand	Low/High	How much time pressure did you feel due to the rate or pace at which the tasks or task elements occurred? Was the pace slow and leisurely or rapid and frantic?
Performance	Good/Poor	How successful do you think you were in accomplishing the goals of the task set by the experimenter (or yourself)? How satisfied were you with your performance in accomplishing these goals?
Effort	Low/High	How hard did you have to work (mentally and physically) to accomplish your level of performance?
Frustration Level	Low/High	How insecure, discouraged, irritated, stressed and annoyed versus secure, gratified, content, relaxed and complacent did you feel during the task?

In the original NASA-TLX questionnaire, respondents are asked in part III to assess the workload with regards to different tasks. In this current research, the tasks were replaced by a few situations (table 4). These reflect common situations in the work of nurses with regards to the admission of patients at the general wards. In the first situation, it is described that an elective patient must be admitted to the ward. The second situation described the admission of an acute patient. It is an average day at the ward in the first two situations (average bed occupation). In the third situation, it is busy at the ward and an acute patient needs to be admitted. For each situation, the nurses had to indicate the height of the workload of each of the six aspects they experienced in that particular situation on a scale from 0 to 100.

Table 4 The situations studied in the questionnaire (in English)

Situation 1	*Situation 2*	*Situation 3*
It is an **average** day at the ward regarding the amount of admissions and the bed occupation. The patient load is also average complex. At a certain moment, an **elective** patient (average complex) arrives and needs to be admitted to the ward. Please indicate for every aspect of workload how high or low the aspect is in this example.	It is an **average** day at the ward regarding the amount of admissions and the bed occupation. The patient load is also average complex. At a certain moment, you get a phone call through the official path that a new **acute** patient (average complex) needs to be admitted to the ward. Please indicate for every aspect of workload how high or low the aspect is in this example.	It is a **busy** day at the ward. Lots of patients are admitted and the patients at the ward demand a lot of care. You get disturbed a lot in your work by phone calls. Next, you get a phone call through the official path that a new **acute** patient needs to be admitted to the ward. Please indicate for every aspect of workload how high or low the aspect is in this example.

Table 5 summarizes the three situations. The first two situations thus study the effect of the patient type on the workload; the second and third situation the effect of the ward occupation on the experienced workload for an acute patient.

Table 5 Summary of the three situations

Situation	Patient type	Ward occupation
1	Elective	Average
2	Acute	Average
3	Acute	Busy

A paired t-test was performed to analyse the differences between the scores on each of the six aspects for the effect of the patient type on the workload (situation 1 compared with situation 2); and the effect of the ward occupation with the admission of an acute patient (situation 2 compared with situation 3). The values of the "weighted workload" (WWL) are paired, for they are filled out by the same nurse. If a respondent gives an overall higher workload on the first situation, he is most likely to also indicate a high workload on the second situation.

An ANOVA test was performed to determine whether there were differences in the experienced workload between different groups (sex, age, the ward and employment)[26].

Acute patients are an unplanned interruption in the work processes of nurses. Elective patients are scheduled for a certain moment. Therefore it was expected that nurses will score a higher weighted workload in the questionnaire with the admission of an acute patient than with an elective patient. With an AMU, the acute patients arriving at the ward will be more predictable.

At some days, there may be more patients at the ward than on other days. This higher bed occupation may lead to a higher stress level for the nurses. When an acute patient needs to be admitted on a busy day, this might lead to an even higher experienced workload than on other days. The situation with an acute patient and a busy ward occupation in the questionnaire will therefore probably have the highest weighted workload score.

At the end of the questionnaire, the nurses had the option to leave remarks regarding the questionnaire in an open text field.

Calculation Weighted Workload

As mentioned earlier, in part II, the nurses are asked to choose among pairs which aspect of workload they consider to have the highest influence on their overall experienced workload. For each of the six aspects, how many times a nurse has chosen that aspect was counted. This is the weight of that aspect of the workload (a value of 0 to 5). In part III, for every described situation, the nurses indicated the height of every aspect in that particular situation (from 0 to 100). This number is multiplied by the weight. The maximum score of the sum of those six multiplications is 1500 (5x100 + 4x100 + 3x100 + 2x100 + 1x100 + 0x100). The sum of those six numbers was therefore divided by 15 to get the Weighted Workload Score (WWL) for each situation on a scale of 0 to 100[28].

The first concept of the questionnaire was presented to four board members of the Nurse Advice Council (in Dutch: 'Verpleegkundige Advies Raad'). They were asked whether the questionnaire is comprehensible and the described situations were recognisable for the nurses. After some

adjustments and approval of the Nurse Advice Council, the operational managers of the general wards sent an e-mail with a link to the web-based questionnaire to all nurses of each ward, excluding the student nurses. After two weeks, a reminder was sent.

3. Results

This chapter addresses the results of the study. §3.1 focuses on the amount and type of acute patients in 2010. The results regarding the experienced workload of nurses are described in §3.2.

3.1 Amount and type of acute patients

This paragraph consists of three parts: §3.1.1 describes the overall situation in 2010 regarding the acute admissions. The situation in 2010 of the six general medical wards and the UZ is addressed in §3.1.2. The last part, §3.1.3, focuses on the situation in Deventer Hospital if an AMU had been implemented in 2010.

3.1.1 Acute admissions - overall situation in 2010

In 2010, there were 17,985 visits to the emergency department. Of those visits, 9,098 acute patients were admitted to a department in the hospital, of which 50.8% male and 49.2% female. Table 6 shows the age distribution of those acute admissions. The majority (71.4%) of patients acutely admitted to the hospital in 2010 are 50 years or older. The age distribution is more or less the same for men as for women. However, the percentage of women between 80 and 89 years (20.0%) and older than 90 years (4.5%) is higher than the percentage of men between 80 and 89 years (15.2%) and older than 90 years (1.9%). All the acute patients are admitted through the emergency department to a certain department in the hospital, besides the patients who immediately go home after arrival at the emergency department.

Table 6 Age distribution of the acute admissions in 2010

Age group	*N* (%)
0-9 years	521 (5.7%)
10-19 years	300 (3.3%)
20-29 years	413 (4.5%)
30-39 years	486 (5.3%)
40-49 years	879 (9.7%)
50-59 years	1,164 (12.8%)
60-69 years	1,558 (17.1%)
70-79 years	1,892 (20.8%)
80-89 years	1,599 (17.7%)
90 years and older	285 (3.1%)
Total	**9,097 (100.0%)**
Missing	1

The total amount of acute admissions from the emergency department per day in 2010 is shown in figure 1. There is large variation in the amount of acute admissions per day: between 10 and 40 acute patients per day.

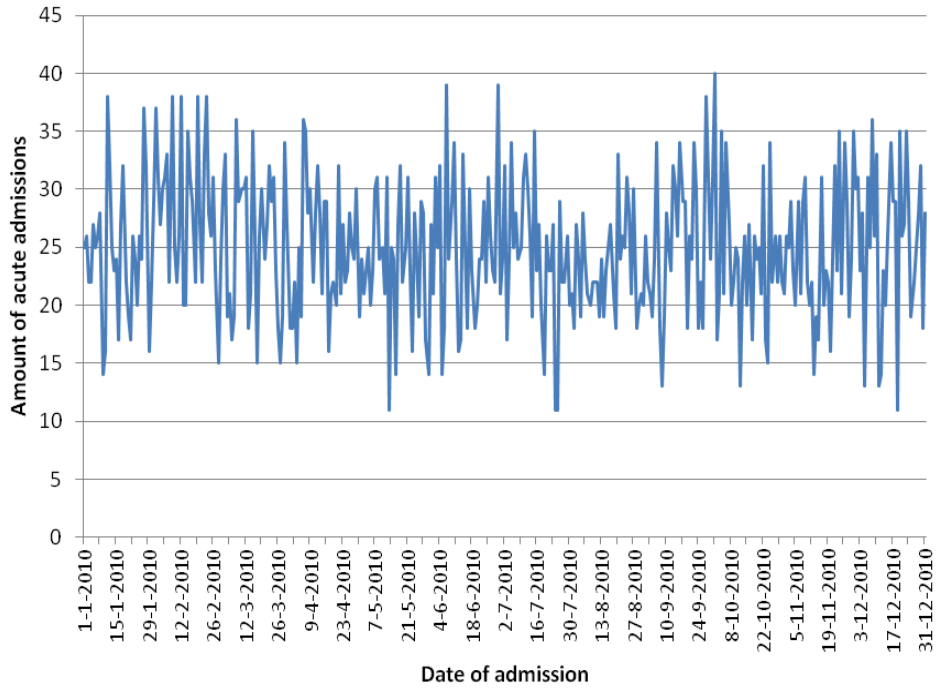

Figure 1. Total amount of acute admissions per day in 2010 (overall N = 9,098)

The total amount of acute admissions in 2010 per month varies between 700 and 800 acute admissions (figure 2). August shows a decrease in the amount of acute admissions, whereas February and December have a higher amount of acute admissions. A chi-square test showed that there were no significant differences in the amount of acute admissions per month ($p>0.05$).

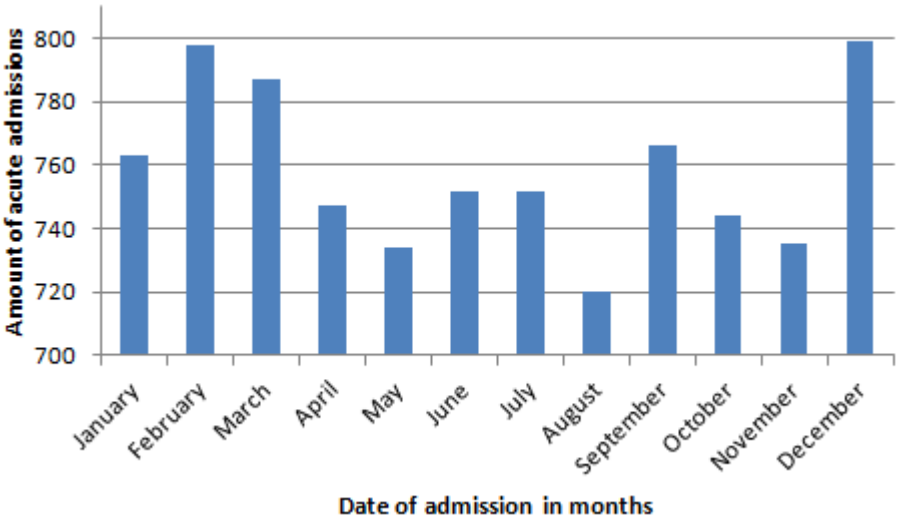

Figure 2. Total amount of acute admissions per month in 2010 (overall N = 9,098)

A certain variation in the amount of acute admissions exists for the day of the week, which can be seen in figure 3 for the total amount of acute admissions. During weekends (Saturday and Sunday), the amount of acute admissions is lower than on other days of the week (Chi-squared test: χ^2 = 112.9, $p<0.001$). Further descriptive statistics of the amount of acute admissions per day (e.g. mean and standard deviation) are shown in Appendix II.

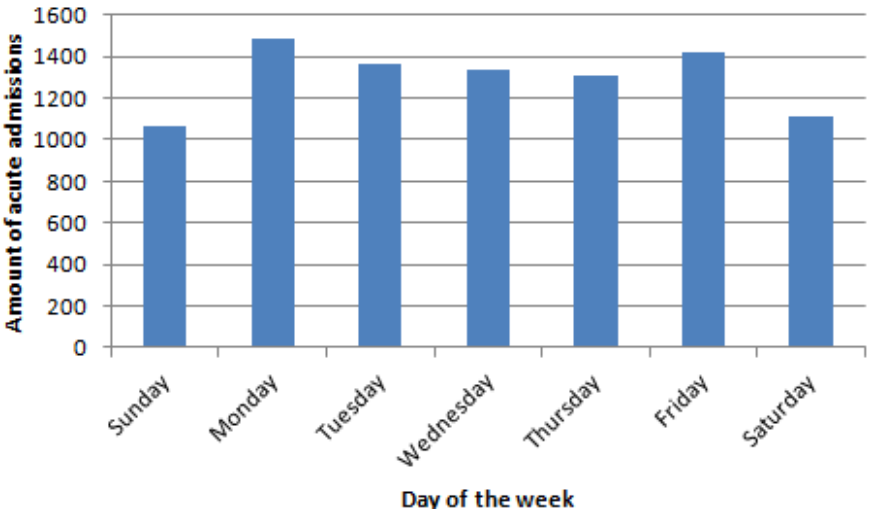

Figure 3. Total amount of acute admissions per day of the week in 2010 (overall N = 9,098)

3.1.2 Acute admissions to the six general wards and the UZ – situation in 2010

3,741 acute patients were admitted from the emergency department to the six general medical wards (table 7). Together with the UZ, 5,687 acute patients were admitted to the six general wards and the UZ (49.0% men; 51.0% women).

Table 7 Acute admissions to the six general medical wards and the UZ in 2010

Ward	*N* (%)
A2	649 (11.4%)
B2	913 (16.1%)
C2	801 (14.1%)
D2	545 (9.6%)
E2	357 (6.3%)
G2	476 (8.3%)
UZ	1,946 (34.2%)
Total	**5,687 (100.0%)**

The age distribution of the acute admissions to the six general medical wards and the UZ (table 8) is somewhat different from the overall age distribution of the acute admissions in 2010, especially the acute patients between 0 and 9 years (5.7% vs. 0.2%).

Table 8 Age distribution of the acute admissions to the six general medical wards and the UZ in 2010

Age group	*N* (%)
0-9 years	12 (0.2%)
10-19 years	98 (1.7%)
20-29 years	354 (6.2%)
30-39 years	383 (6.7%)
40-49 years	587 (10.3%)
50-59 years	728 (12.8%)
60-69 years	1,000 (17.6%)
70-79 years	1,205 (21.2%)
80-89 years	1,087 (19.1%)
90 years and older	233 (4.1%)
Total	**5,687(100.0%)**

The amount of acute admissions per month for the six wards and the UZ in 2010 (figure 4) varies among the year 2010 for each department. For instance, A2 has a peak in the amount of acute admissions in July; B2 has a peak in August.

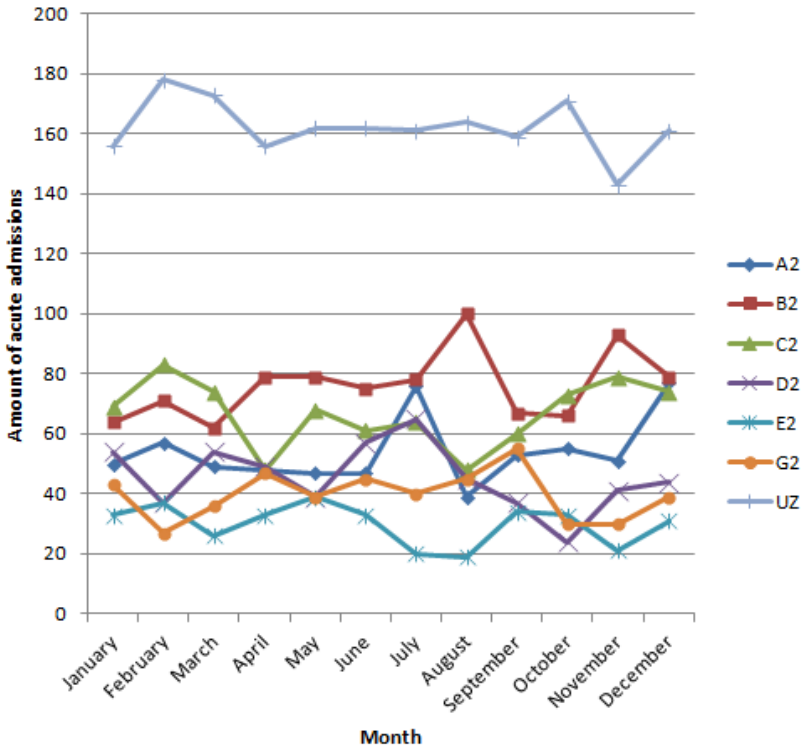

Figure 4. Amount of acute admissions per month to the six wards and the UZ in 2010 (overall N = 5,687)

Figure 5 shows the amount of acute admissions per day of the week for the six general medical wards and the UZ. During weekends, there are significantly less acute admissions (Chi-squared test: $\chi^2 = 91.3$, $p<0.05$).

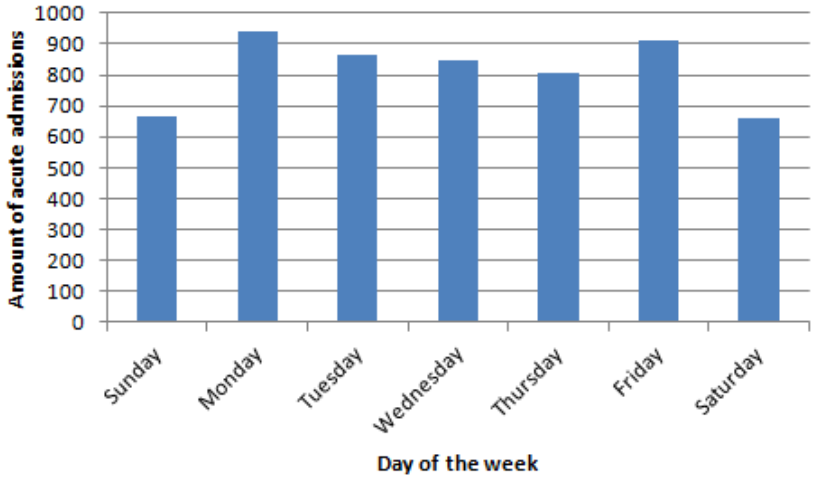

Figure 5. Amount of acute admissions per day of the week to the six general wards and the UZ in 2010 (overall N = 5,687)

However, when analyzing the six wards and the UZ separately, the distribution of acute admissions per day of the week does not differ much from the total amount of acute admissions to the six wards and the UZ.

Medical specialties

The distribution of the medical specialties over the six general medical wards can be seen in figure 6. At A2, mostly patients are admitted of internal medicine. At B2, patients of the medical specialties internal medicine, clinical geriatrics and neurology are especially admitted to the ward. The most common medical specialty at C2 is surgery and gastroenterology, at D2 surgery and orthopaedics. E2 admits especially patients of urology and surgery. Respiratory medicine is the most common medical specialty at G2. Internal medicine is the largest admitting specialty at the UZ. After that, patients often are admitted for surgery and respiratory medicine.

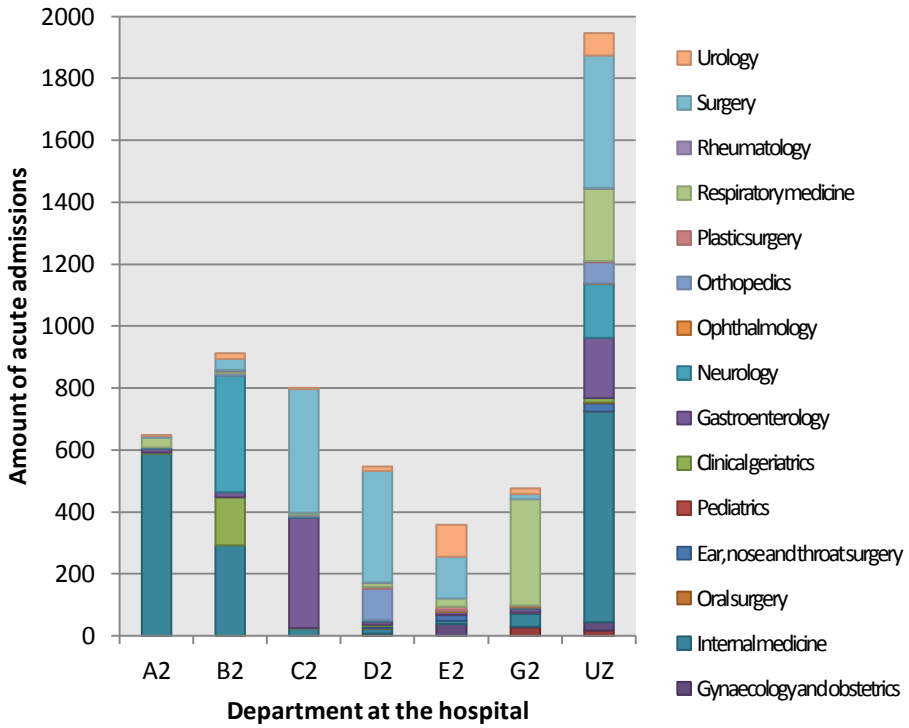

Figure 6. Distribution of the medical specialties among the six general medical wards and the UZ in 2010 (overall N = 5,687)

Studying the medical specialties separately for the amount of admissions per day of the week, only orthopedics (part of D2) stands out. 43.3% of the patients with the admitting medical specialty is admitted on a Wednesday.

Analyzing the distribution of the medical specialties for the six wards together with the UZ, especially patients for internal medicine and surgery are admitted (figure 7).

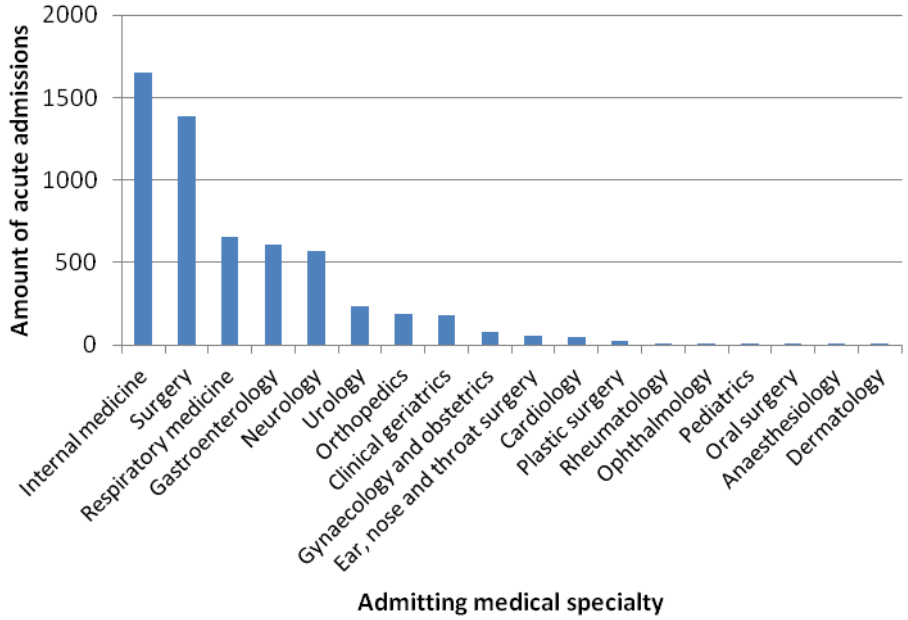

Figure 7. Admitting medical specialties at the six general wards and the UZ in 2010 (overall N = 5,687)

Length of hospital stay

To determine which patients still will be admitted to a ward when an AMU is implemented at the hospital, the length of hospital stay is analysed for each general medical ward and the UZ. 14 records were eliminated from the analysis, because the discharge dates were unknown.

Table 9 shows the overall statistics of the duration of hospital stay. Ward B2 has the longest average length of hospital stay (195.8 hours), ward E2 the shortest average length of hospital stay (96.8 hours). The minima of the six wards and the UZ are very low (even 0 hours), because of the rounding of numbers. A minimum of 0 hours of hospital stay in this table means that the patient stays less than one hour in the hospital, for instance 45 minutes. There are differences in the average length of hospital stay between the wards and the UZ (ANOVA test: F =36.6, $p < 0.001$).

Table 9 Descriptive statistics of the length of hospital stay in hours for the six wards and the UZ in 2010

	Overall	A2	B2	C2	D2	E2	G2	UZ
N	5,687	649	913	801	545	357	476	1,946
Mean	143.0	183.4	195.8	145.1	154	96.8	146.4	108.4
Std. Deviation	178.7	194.0	187.8	171.4	188.3	129.5	137.8	176.2
Median	94	140	144	93	115	66	115	59
Minimum	0	3	1	0	1	1	1	0
Maximum	3,091	1,938	1,557	2,372	1,746	1,315	1,056	3,091
5^{th} percentile	9	23	21	20	18	11	22	5
95^{th} percentile	440.1	490	549.2	454	427.7	286.1	404	358.5

Ward E2 has a smaller variation in the length of hospital stay than the other five wards and the UZ (figure 8). As mentioned in the methods section, each box plot in figure 8 consists of the minimum, the lower quartile (25^{th} percentile), the median, the upper quartile (75^{th} percentile) and the maximum. In the box plot, two types of outliers are identified by symbols: circles for outliers, and stars for extreme outliers. The y-axis is shortened to 50 days of hospital stay: a few outliers (N = 25) are therefore no longer visible in this graph.

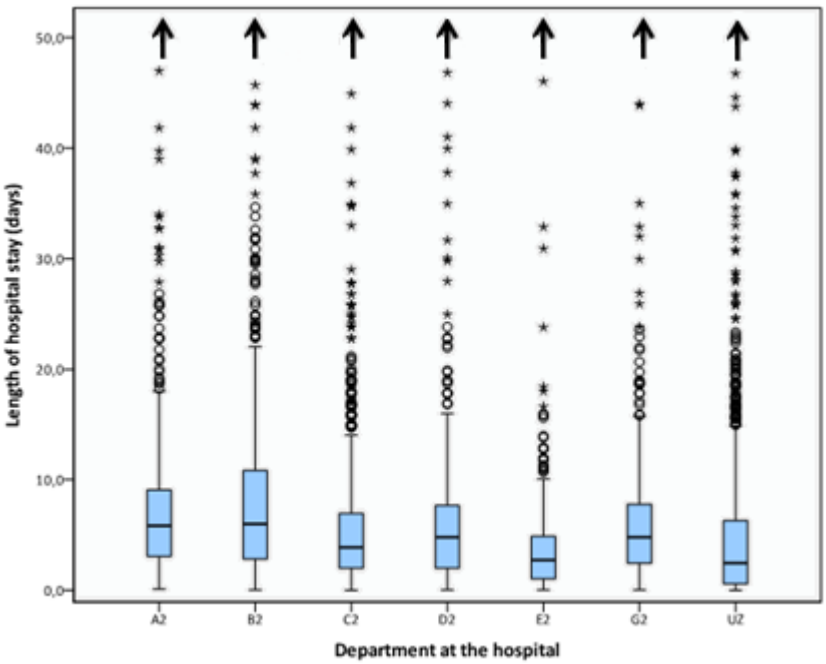

Figure 8. Length of hospital stay of acute admissions to the six wards and the UZ in 2010 (overall N = 5,687)

The length of hospital stay is divided into four groups with a length of hospital stay:

- Shorter than 24 hours;
- 24 – 47 hours;
- 48 – 71 hours;
- 72 hours and longer.

The distribution of the four groups for each general medical ward and the UZ is shown in figure 9. Ward E2 stands out among the six wards: more than half (55.2%) of the acute patients admitted to ward E2 have a shorter length of hospital stay than 72 hours. At the other five general wards mostly acute patients with a longer length of hospital stay than 72 hours are admitted; at ward A2 even more than three-quarters of the acute patients (76.6%). Almost 800 (40.1%) patients admitted at the UZ were discharged within 24 hours; more than half of the patients (55.5%) within 72 hours.

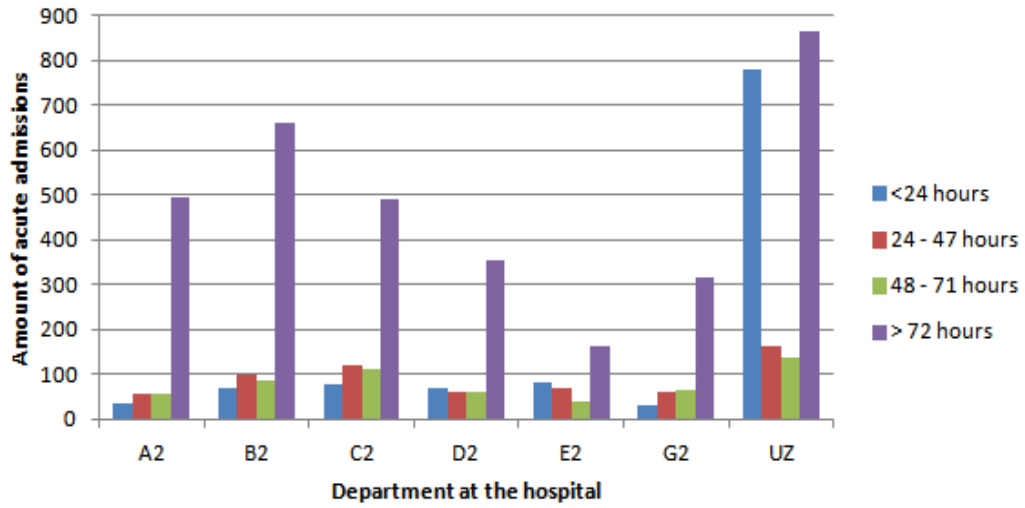

Figure 9. Amount of acute admissions to the six general wards and the UZ in 2010 by duration of hospital stay (overall N = 5,687)

Hours of hospital stay per medical specialty

Per medical specialty, the variation in the length of hospital stay is shown in figure 10 for the six wards and the UZ. The y-axis is shortened to 40 days of hospital stay. Therefore, 53 outliers are not visible in this graph. The figure shows that one medical speciality has a greater variation than the other. Dermatology, oral surgery, ophthalmology, plastic surgery and rheumatology are specialties with a small variation and a relatively shorter length of hospital stay. Patients of all these specialties are admitted to ward E2, except for dermatology (ward B2). Internal medicine and surgery are the medical specialties with the largest amount of admitted acute patients and have an average length of hospital stay of respectively 160.2 hours and 138.0 hours.

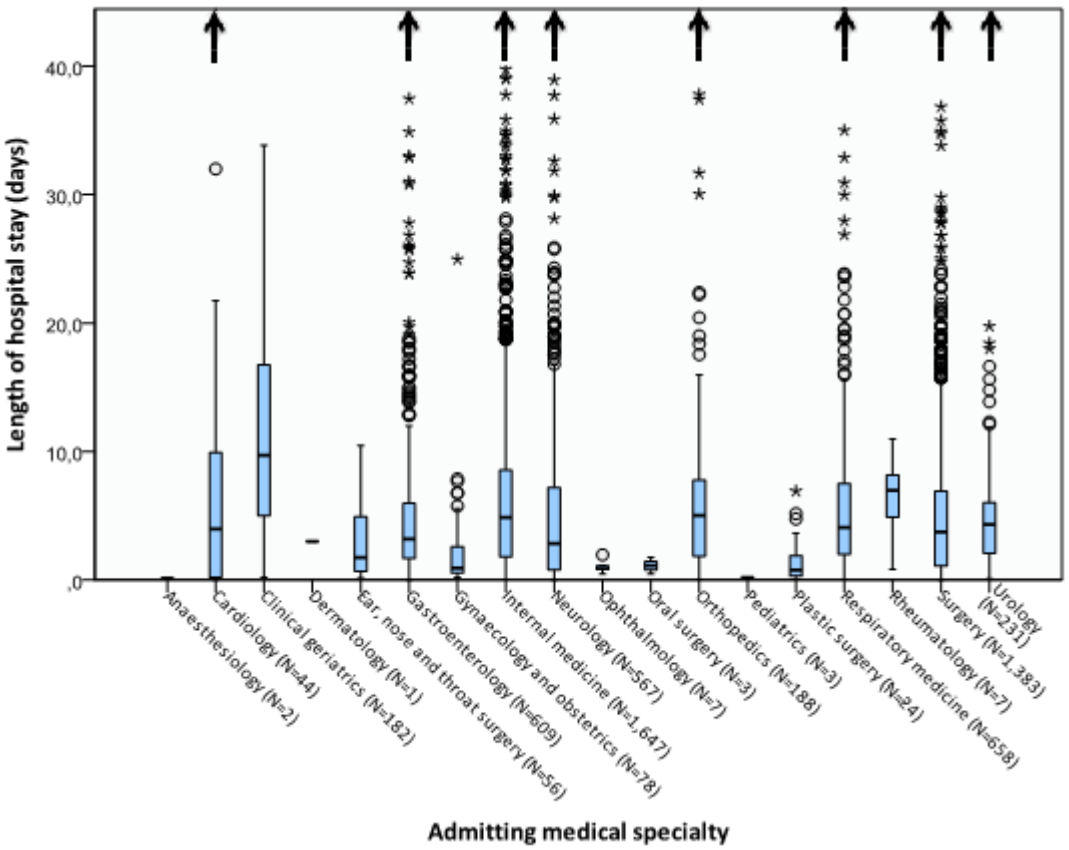

Figure 10. Box plots of the length of hospital stay in days of acute patients per medical specialty (to the six wards and UZ) in 2010 (overall N = 5,687)

For the medical specialties with a larger amount of admitted acute patients (*N* > 500), the graph in figure 11 shows the hours of hospital stay. The majority of patients (overall 58.4%) of these medical specialties have a longer length of hospital stay than 72 hours.

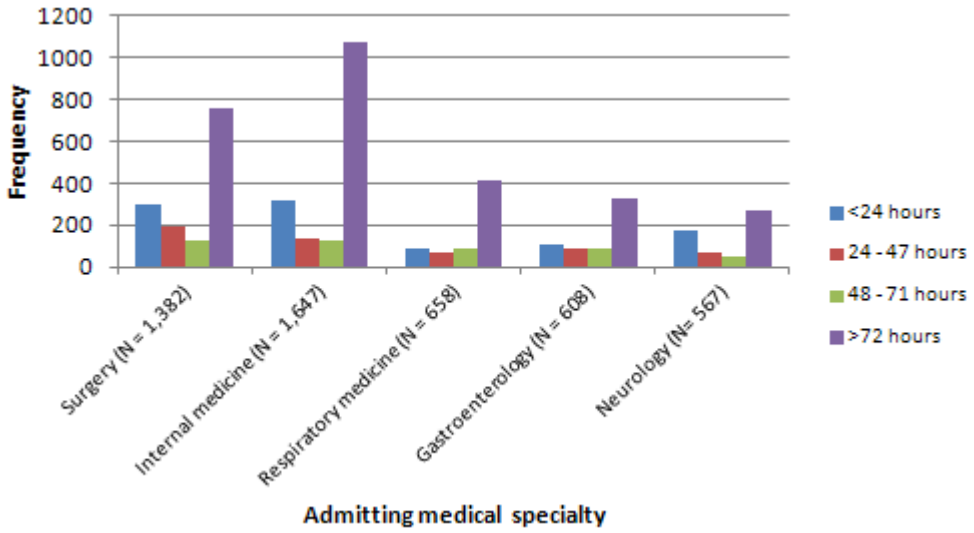

Figure 11. Amount of acute admissions of the larger medical specialties (N > 500) to the six wards and the UZ in 2010 by duration of hospital stay

3.1.3 The AMU at Deventer Hospital

If an AMU had been implemented in Deventer Hospital in 2010, 5,039 acute patients would have been admitted to this unit. These are all acute admissions in 2010 to the six general wards and the UZ, minus the patients of the admitting medical specialties neurology (*N* = 567), gynecology & obstetrics (*N* = 78) and pediatrics (*N* = 3). Of the acute patients that would have been eligible for an AMU in 2010, 49.4% was male and 50.6% female. The majority of acute patients at the AMU would have been 70 years and older (table 10).

Table 10 Age distribution of the acute admissions to a potential AMU at Deventer Hospital in 2010

Age group	*N* (%)
0-9 years	10 (0.2%)
10-19 years	88 (1.7%)
20-29 years	293 (5.8%)
30-39 years	327 (6.5%)
40-49 years	513 (10.2%)
50-59 years	658 (13.1%)
60-69 years	912 (18.1%)
70 years and older	2,238 (44.4%)
Total	**5,039(100.0%)**

The average length of hospital stay of the acute patients eligible for an AMU at Deventer Hospital is 146.3 hours (table 11). There is wide variation in the length of hospital stay (standard deviation of 181.7 hours).

Table 11 Statistics of the length of hospital stay in hours for an AMU at Deventer Hospital in 2010

	Overall
N	5,039
Mean	146.3
Std. Deviation	181.7
Median	96
Minimum	0.2
Maximum	3,091
5th percentile	10
95th percentile	438.3

In figure 12 the amount of acute admissions eligible for an AMU over time are shown. The blue line is the average amount of acute admissions in 2010. If an AMU of 24 hours and 20 beds (red striped line) had been implemented in the Deventer Hospital in 2010, on 39 days the AMU would have been full and patients could not be admitted to the AMU. This is 10.7% of the total days in 2010. In case of an AMU of 24 hours with 24 beds (green dotted line), on six days in 2010 all the beds at the AMU would have been occupied (1.6%).

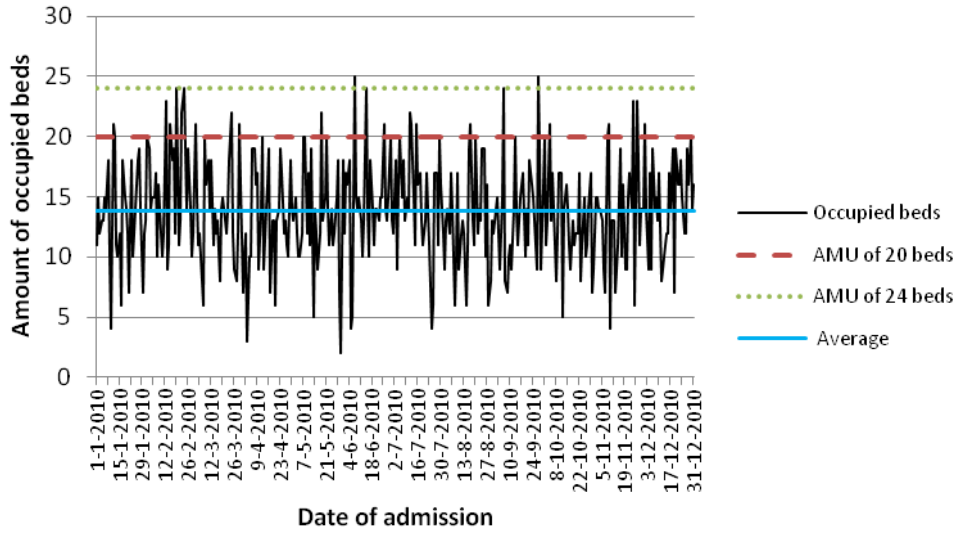

Figure 12. Occupied beds per day at an AMU of 24 hours when implemented in 2010 (N = 5,039)

If an AMU of 48 or 72 hours had been implemented in the hospital, the graphs would look different (figure 13 and 14). In that case, an AMU of 24 beds would not be sufficient. A patient who has a longer hospital stay than one day, would also occupy a bed on the second (or even third) day and therefore one bed less is available for the newly admitted acute patients from the ED. When an AMU of 48 hours and 20 beds (red striped line) had been implemented at the Deventer Hospital in 2010, the AMU would have been full on 281 days (77.0% of the time) and patients could not be admitted to the AMU. In case of an AMU of 48 hours with 24 beds (green dotted line), 182 days in 2010 all the beds at the AMU would have been occupied (50.0%). For an AMU of 72 hours, the AMU would have been full on 361 days (98.9%) in 2010 with 20 beds and 348 days (95.3%) with 24 beds.

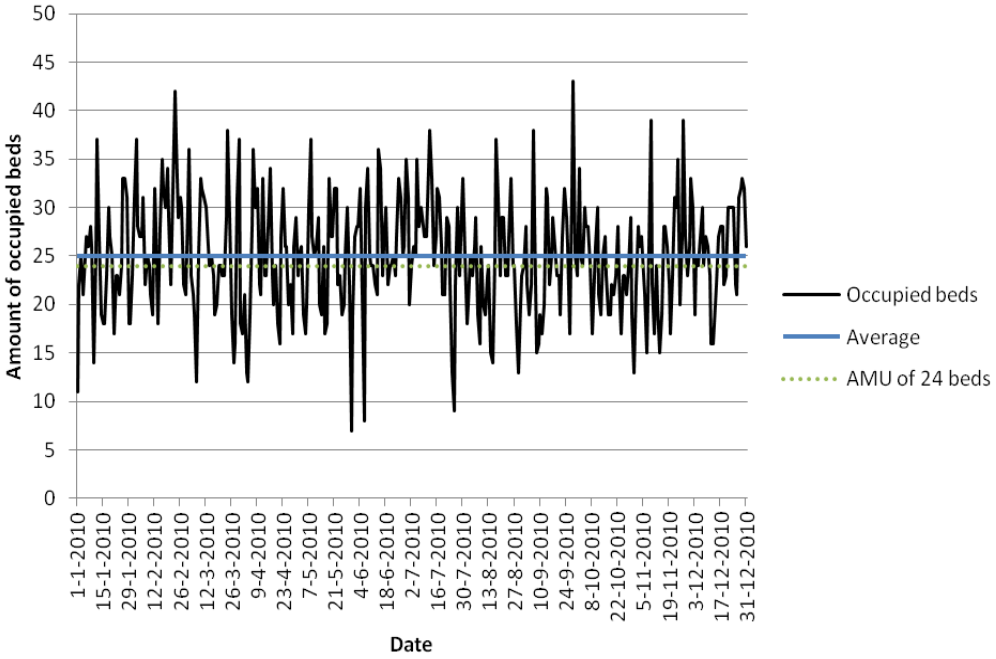

Figure 13. Occupied beds per day at an AMU of 48 hours when implemented in 2010 (N = 5,039)

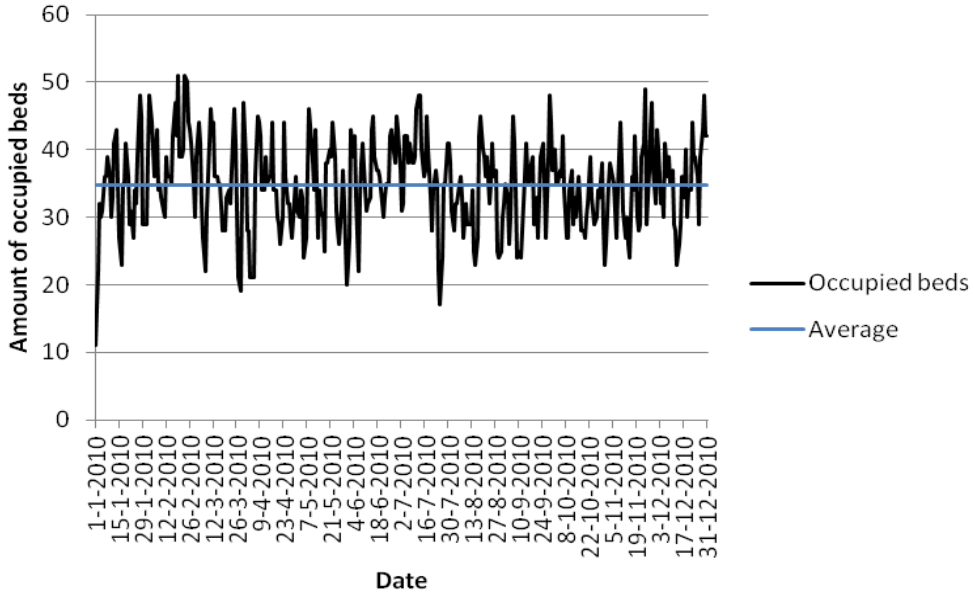

Figure 14. Occupied beds per day at an AMU of 72 hours when implemented in 2010 (N = 5,039)

If an AMU would have been implemented at the Deventer Hospital in 2010, most acute patients would first be admitted to the AMU before transfer to the general wards. Some patients would not even be admitted to the general medical wards. They would have been discharged from the hospital after admission to the AMU, because their length of hospital stay is shorter than the maximum length of hospital stay of the AMU. Therefore, a certain amount of hours of hospital stay would no longer end up at the general wards. This amount of hours of hospital stay is calculated for every ward and the UZ. The amount of hours eligible for the AMU (and removed from the wards) is calculated by summing the length of hospital stay of all patients with a shorter length of hospital stay than 48 hours (in case of an AMU of 48 hours) with the hours *up to* 48 hours of the patients with a longer length of hospital stay. Excluded from this analysis are:

- patients admitted to the EHH;
- patients admitted to the cardiac care unit;
- patients admitted to the intensive care unit;
- patients of the admitting medical specialty neurology, gynecology & obstetrics and pediatrics.

For the six wards, the UZ and an AMU of 24, 48 and 72 hours, the calculation of the amount of hours of hospital stay eligible for an AMU is made (table 12). 5,039 acute patients in 2010 would have been admitted to an AMU.

The *third* column in table 12 indicates the total amount of acute patients for each ward and the UZ in 2010. The *fourth* column gives the total acute patients which are eligible for an AMU. This is thus the amount of the third column minus the patients of the admitting medical specialties neurology, gynaecology & obstetrics and paediatrics. Of the patients eligible for an AMU, the total length of hospital stay in hours is given in the *fifth* column. For the acute patients with a longer hospital stay than the maximum length of stay at the AMU (*sixth* column), the time they spent at the potential AMU (*seventh* column) is calculated by multiplying the amount of patients with the maximum length of stay at the AMU (24, 48 or 72 hours). The *eighth* column gives the amount of patients with a shorter length of hospital stay than 24, 48 or 72 hours and the *ninth* column gives their total length of hospital stay. The total potential hours for an AMU (*tenth* column) is the sum of the seventh and ninth column. The *eleventh* column gives the amount of hours, which will eventually go to the general medical wards. The current amount of beds at each general ward and the UZ is given in the *twelfth* column and the total hours available in 2010 for each ward and the UZ in the *thirteenth* column. The *last* column in table 12 calculates the percentage of the total amount of hours of each ward which will no longer go to the ward because of the AMU: the tenth column divided by the thirteenth column.

Results table 12

The hours of hospital stay of acute patients admitted to ward E2 will be the least affected if an AMU is implemented in Deventer Hospital: 2.2% to 5.1% of all the hours at ward E2 in 2010 will be taken away from the wards in case of an AMU. For ward C2 for instance, these numbers are 5.1% to 13.0%. In total, an AMU will take respectively 5.1%, 9.2% or 12.9% away of all the hours at the six wards and the UZ by admitting those patients to an AMU of 24, 48 or 72 hours.

However, ward E2 admits the least amount of acute patients. Analyzing the amount of acute patients instead of the length of hospital stay, ward E2 will be the most affected by an AMU: more than half of the acute patients admitted to E2 (161/317 = 50.8%) will no longer be admitted to the ward in case of an AMU of 72 hours. Between 19.6% (B2) and 38.4% (C2) of the acute patients will no longer be admitted to the other five wards. Ward B2 will thus be the least affected by an AMU regarding the amount of acute patients. The sixth column in table 12 gives the amount of acute patients that still will go to a ward in case of an AMU at Deventer Hospital.

The UZ is a special case. This department will close in case of an AMU at the hospital. Therefore, the percentage of hours of hospital stay that will be taken away from the wards (or in this case: from the department UZ) is not applicable in this case. A large amount of acute patients of the UZ (*N* = 1,740) would have been admitted to an AMU in 2010. The UZ admits more than a third (34.5%) of all the acute patients eligible for an AMU.

With an AMU of 24 hours, 112,527 hours of hospital stay would have been eligible for an AMU in 2010 (sum of the six wards and the UZ). For 48 hours and 72 hours, the amount of hours would have been respectively 205,446 and 286,696 hours.

28.7% (1,444/5,039) of all the patients admitted to the AMU have a shorter length of hospital stay than 48 hours and will therefore not be admitted to a ward. This is respectively 18.5% for an AMU of 24 hours and 38.4% for an AMU of 72 hours.

In Appendix IV, the distribution of the medical specialties at the AMU is shown. For an AMU of 24, 48 and 72 hours is calculated how many acute patients are going home within the maximum stay at the AMU. Especially patients of the medical specialties internal medicine and surgery will be admitted to the AMU. Almost 90% (86.8%) of the patients of clinical geriatrics have a longer length of hospital stay than 72 hours. This means that almost all of these patients will still go to the wards in case of an AMU. Medical specialties with fewer admitted acute patients like oral surgery and ophthalmology (mostly admitted to E2) are the medical specialties at the general wards that will mostly be affected by implementing an AMU.

Table 12 Calculation of the potential hours for an AMU in Deventer Hospital in 2010

	AMU of.. (hours)	Total acute patients (N)	Total acute patients eligible for AMU (N)	Total length of hospital stay of the eligible patients (hours)	Acute patients longer than 24/48/72 hours (N)	Acute patients multiplied with 24/48/72 (hours)	Patients shorter than 24/48/72 hours (N)	Total length of hospital stay shorter than 24/48/72 hours (hours)	Total potential for AMU (hours)	Hours going to the wards with an AMU (hours)	Beds at the ward or UZ (N)	Total hours[a]	Percentage away from ward (%)
Total	24	5,685	5,039	724,818	4,107	98,568	932	13,959	112,527	612,291	254	2,225,040	5.1%
	48	5,685	5,039	724,818	3,595	172,560	1,444	32,886	205,446	519,372	254	2,225,040	9.2%
	72	5,685	5,039	724,818	3,104	223,488	1,935	63,208	286,696	438,122	254	2,225,040	12.9%
A2	24	649	646	119,231	611	14,664	35	634	15,298	103,933	39	341,640	4.5%
	48	649	646	119,231	554	26,592	92	2,714	29,306	89,925	39	341,640	8.6%
	72	649	646	119,231	496	35,712	150	6,296	42,008	77,223	39	341,640	12.3%
B2	24	913	536	120,351	517	12,408	19	375	12,783	107,568	39	341,640	3.7%
	48	913	536	120,351	475	22,800	61	2,056	24,856	95,495	39	341,640	7.3%
	72	913	536	120,351	431	31,032	105	4,832	35,864	84,487	39	341,640	10.5%
C2	24	801	796	115,920	721	17,304	75	1,327	18,631	97,289	42	367,920	5.1%
	48	801	796	115,920	600	28,800	196	5,881	34,681	81,239	42	367,920	9.4%
	72	801	796	115,920	490	35,280	306	12,727	48,007	67,913	42	367,920	13.0%
D2	24	545	534	81,999	471	11,304	63	2,149	13,453	68,546	38	332,880	4.0%
	48	545	534	81,999	410	19,680	124	3,181	22,861	59,138	38	332,880	6.9%
	72	545	534	81,999	351	25,272	183	6,693	31,965	50,034	38	332,880	9.6%
E2	24	357	317	31,384	256	6,144	61	924	7,068	24,316	36	315,360	2.2%
	48	357	317	31,384	193	9,264	124	2,785	12,049	19,335	36	315,360	3.8%
	72	357	317	31,384	156	11,232	161	4,970	16,202	15,182	36	315,360	5.1%
G2	24	476	470	62,227	411	9,864	59	439	10,303	51,924	40	350,400	2.9%
	48	476	470	62,227	389	18,672	81	2,667	21,339	40,888	40	350,400	6.1%
	72	476	470	62,227	325	23,400	145	6,635	30,035	32,192	40	350,400	8.6%
UZ	24	1,944	1,740	193,706	1,120	26,880	620	8,111	34,991	158,715	20	N.A.	N.A.
	48	1,944	1,740	193,706	974	46,752	766	13,602	60,354	133,352	20	N.A.	N.A.
	72	1,944	1,740	193,706	855	61,560	885	21,055	82,615	111,091	20	N.A.	N.A.

[a] Calculation of the total hours is the amount of beds at each ward (or the UZ) times 24 hours and 365 days.

3.2 Experienced workload

The web-based questionnaire was sent to 193 nurses of the six general wards at Deventer Hospital (table 13). Student nurses were excluded from the study.

Table 13 Amount of nurses per ward in 2010

Ward	Population *N* (%)	Respondents *N* (%)
A2	28 (14.5%)	17 (15.6%)
B2	38 (19.7%)	22 (20.2%)
C2	35 (18.1%)	17 (15.6%)
D2	35 (18.1%)	22 (20.2%)
E2	30 (15.6%)	11 (10.1%)
G2	27 (14.0%)	20 (18.3%)
Total	**193 (100%)**	**109 (100%)**

Of the 193 nurses, 109 nurses (56.5%) completely filled out the web-based questionnaire. There were also 42 partial responses. Of those partial responses, some (*N* = unknown) may have filled out the questionnaire completely another time and therefore became part of the 109 complete responses. Most of the partial responses stopped filling out the questionnaire after only completing the first four background questions. Therefore, the partial responses were eliminated from the analysis.

Of the 109 nurses, more women (91.7%) than men (8.3%) filled out the questionnaire. For the overall population, the sex distribution is 91.3% female and 8.7% male. The respondents are therefore a good representation of the population regarding the sex distribution. The age distribution is shown in table 14. The response per age group is for all groups about 60%, except for the nurses between 50 and 59 years (48.0%) and the nurses older than 60 years (25.0%). Of those older groups, less nurses thus filled out the questionnaire, but the population (*N* = 25 and *N* = 8) was also smaller. Overall, according to the sex and age distribution, the group of nurses who filled out the questionnaire can be seen as a representative sample of all the nurses at the general wards.

Table 14 Age distribution among the nurses

Age group	Response per age group *n*/*N* (%)
20 – 29 years	30/51 (58.8%)
30 – 39 years	36/61 (59.0%)
40 – 49 years	29/48 (60.4%)
50 – 59 years	12/25 (48.0%)
≥ 60 years	2/8 (25.0%)
Total	**109/193 (56.5%)**

The response of the nurses working at ward E2 (10.1%) is smaller than on the other wards (figure 15). On the other wards, the response rate is between 15 and 20%.

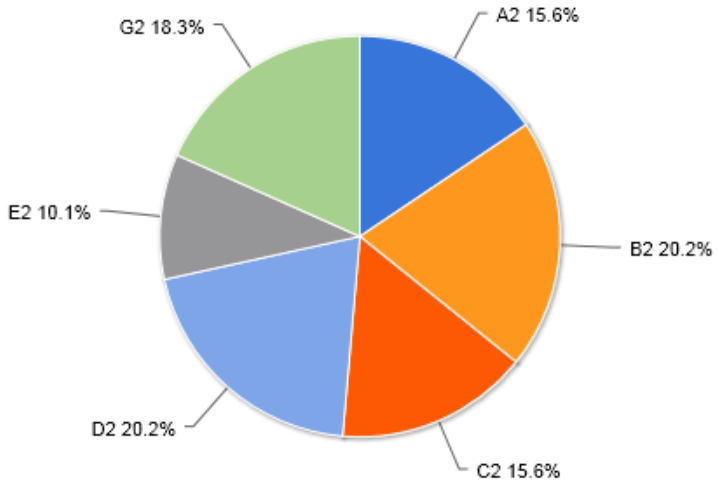

Figure 15. Response of nurses per ward (N = 109)

In the questionnaire, the respondents were asked about their type of employment (table 15). The majority of the respondents (64.2%) work more than or equal to 0.6 FTE (22 hours). Two respondents indicated that they had another type of employment than the first four options. One indicated she was a senior nurse, the other indicated she was a nurse and a project leader.

Table 15 Type of employment among the respondents

Type of employment	*N* (%)
1. Nurse at one of the general wards: Less than 0.6 FTE	22 (20.3%)
2. Nurse at one of the general wards: More than or equal to 0.6 FTE	70 (64.2%)
3. Mobiflex nurse: Less than 0.6 FTE	8 (7.3%)
4. Mobiflex nurse: More than or equal to 0.6 FTE	7 (6.4%)
5. Other	2 (1.8%)
Total	**109 (100.0%)**

3.2.1 Pair-wise comparisons

In part II of the questionnaire, the respondents had to indicate which aspect they considered to contribute the most to their experienced workload through 15 pair-wise comparisons. There is wide variation in how many times each of the six aspects is chosen in the 15 pair-wise comparisons. Figure 16 shows the box plots of the six aspects, namely mental demand, physical demand, temporal demand, performance, effort and frustration level. Further statistics (e.g. mean, standard deviation) can be found in Appendix V.

Of the six aspects, the temporal demand was considered to be of most importance in the experienced workload. The temporal demand is followed by the mental demand, frustration level, performance, effort and last physical demand.

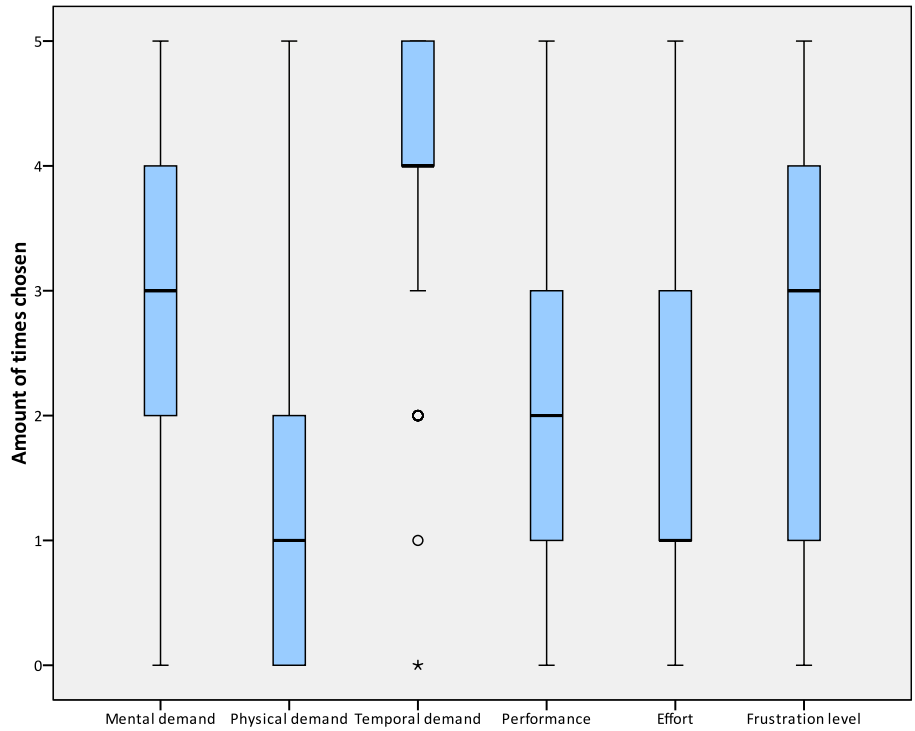

Figure 16. Number of times each aspect of workload is chosen in the 15 pair-wise comparisons (N = 109)

3.2.2 The effect of patient type and ward occupation on the six aspects of workload

In the next part of the questionnaire, the respondents were asked to indicate the importance of each aspect of workload in three different situations on a scale from 0 to 100 (table 5, p. 12). In the first situation, it is described that an elective patient must be admitted to the ward. The second situation describes the admission of an acute patient. It is an average day at the ward in the first two situations (average bed occupation). In the third situation, it is busy at the ward and an acute patient needs to be admitted.

Table 5 (p. 12) Summary of the three situations

Situation	Patient type	Ward occupation
1	Elective	Average
2	Acute	Average
3	Acute	Busy

Table 16 and 17 show the results of the paired t-tests to analyse the differences between the scores on each of the six aspects for the effect of the patient type on the workload (situation 1 compared with situation 2); and the effect of the ward occupation (situation 2 compared with situation 3). The six aspects are sorted by which aspect was the most important in the fifteen pair-wise comparisons (figure 16). Temporal demand was considered to be of most importance in the experienced workload overall, but has the lowest (non-significant) difference in the means in the effect of patient type. In this comparison between an acute and an elective patient, the other five aspects are considered more important in the experienced workload with the admission of an acute patient than with an elective patient. This means that there is no extra demand with regards to the time pressure the nurse experiences, but the mental demand, the frustration level, the effort and the physical demand for a nurse is greater with an acute than with an elective patient. Thus, the performance was experienced to be worse with an acute patient.

When studying the effect of the ward occupation, the mental demand and the frustration level are especially considered more important with a busy ward occupation than with an average ward occupation.

Table 16 Difference in the importance of the six aspects - Effect of patient type**

Aspect	Mean of the difference	Std. Deviation	Std. Error Mean	95% CI of the difference	
				Lower	Upper
Temporal demand	-2.6	18.8	1.8	-6.1	1.0
Mental demand	-4.7*	16.6	1.6	-7.8	-1.5
Frustration level	-5.2*	17.0	1.6	-8.5	-2.0
Performance	-5.4*	16.5	1.6	-8.5	-2.3
Effort	-4.9*	14.4	1.4	-7.6	-2.1
Physical demand	-4.8*	16.4	1.6	-8.0	-1.8

*p<0.05

** Paired Samples t-test

Table 17 Difference in the importance of the six aspects **-** Effect of ward occupation**

Aspect	Mean of the difference	Std. Deviation	Std. Error Mean	95% CI of the difference	
				Lower	Upper
Temporal demand	-26.9*	20.1	1.9	-30.7	-23.1
Mental demand	-31.7*	20.0	1.9	-35.5	-27.9
Frustration level	-31.7*	21.9	2.1	-35.8	-27.5
Performance	-20.8*	23.7	2.3	-25.3	-16.3
Effort	-25.6*	22.4	2.1	-29.9	-21.3
Physical demand	-21.8*	17.1	1.6	-25.1	-18.6

*p<0.05

** Paired Samples t-test

3.2.3 Weighted Workload among the three situations

For each situation, the WWL scores are calculated as described in the methods section. As can be seen in figure 17, a situation with the admission of an acute patient and a busy ward occupation was considered to result in the highest experienced workload. The experienced workload with regards to the effect of the patient type (elective vs. acute) does not differ much. Further statistics of the three situations (e.g. mean, minimum/maximum) are shown in Appendix VI.

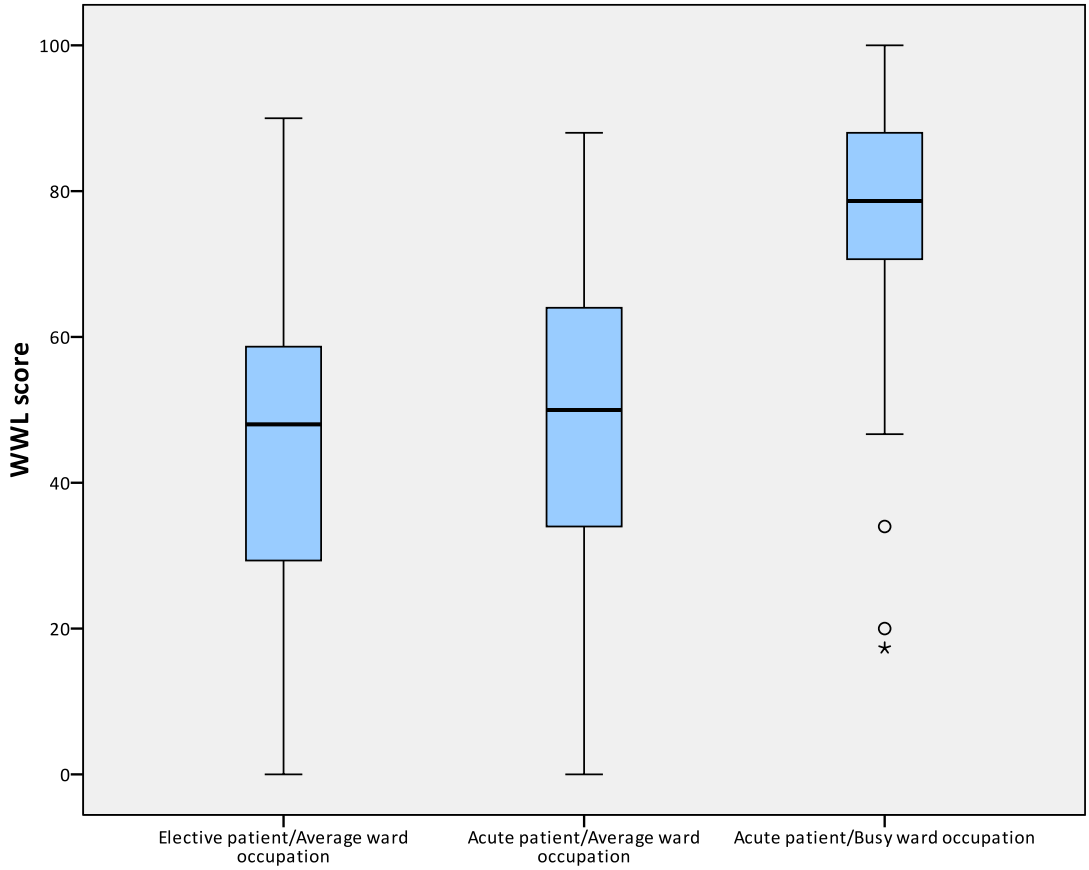

Figure 17. Box plots of the experienced workload in the three situations (total N = 109)

To see whether there are actual differences in the WWL scores between the three situations, a paired t-test is performed for the comparison of the workload of an elective patient versus an acute patient and an average and a busy ward occupation. Table 18 shows that the means of the WWL scores are not equal between an elective and an acute patient and between an average and a busy ward occupation ($p < 0.01$ and $p < 0.001$). An acute patient gives a higher experienced workload than an elective patient. When it is busy at the ward, the experienced workload is higher than in a situation when there is an average amount of patients at the ward. The effect of ward occupation (mean of the difference = -4.2) is larger than the effect of patient type (mean of the difference = -27.8).

Table 18 Difference in WWL score – effect of patient type and ward occupation*

Pair	Mean of the difference	Std. Dev.	Std. Error Mean	95% CI of the difference	
				Lower	Upper
Elective patient – Acute patient	-4.2**	13.4	1.3	-6.7	-1.6
Average ward occupation – Busy ward occupation	-27.8**	17.0	1.6	-31.0	-24.6

* Paired samples t-test

**p<0.05

Age, sex and the employment of the nurses were not related to the WWL scores in the three situations (ANOVA test, $p > 0.05$).

Figure 18 shows the differences of the WWL scores between the six general medical wards. The WWL scores with an acute patient and a busy ward occupation (situation 3) are the highest for each ward. The ward where the nurse mostly works is also not related to the WWL scores in the three situations (ANOVA test, $p > 0.05$).

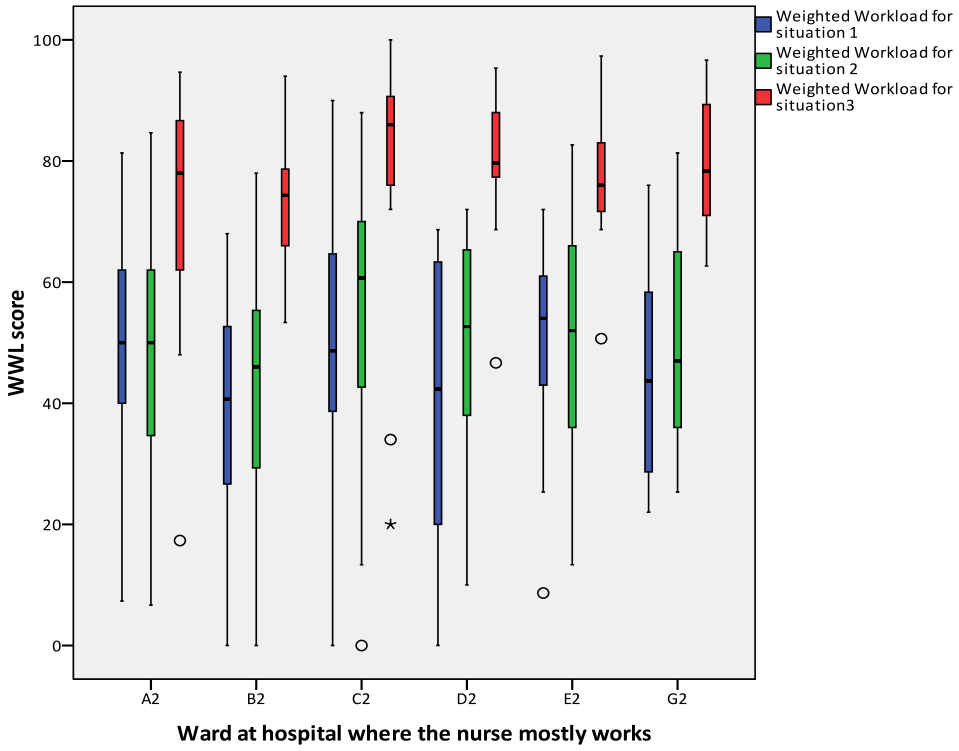

Figure 18. WWL scores among the different wards (N = 109)

3.2.4 Comments of nurses

Multiple nurses (*N* = 5) indicated in an open text box in the questionnaire that the way in which a patient arrives at the ward is critical for the height of the experienced workload with regards to the admission of the patient. When the medication is correctly administered at the emergency department, it takes less effort to admit a new patient.

Another nurse also stated that the time at which the patient is transferred from the emergency department to a ward can be of importance in the experienced workload. At this moment, a lot of patients are transferred around dinner time (noon or 17h00), when less personnel is present at the ward. This contributes to a higher experienced workload.

4. Discussion

4.1 Conclusion

The expected effects of an AMU on the amount and type of acute patients arriving to the general wards are that between 2 and 13 percent of the total hours of hospital stay at each ward would have been taken away from each general ward if an AMU was implemented in Deventer Hospital. An AMU will therefore accomplish a considerable change in the hours of hospital stay at the general wards, especially with an AMU of 72 hours.

Particularly ward E2 at Deventer Hospital will be affected in the amount of patients that still will be admitted to the ward and B2 will be the least affected, regardless the maximum stay at the AMU. However, regarding the hours of hospital stay that will be taken away from the wards by an AMU, ward E2 will be the least affected (2.2% to 5.1%), because the ward admits fewer acute patients than the other five wards. The admitting medical specialties at E2 have an overall shorter length of hospital stay. More than half (50.8%) of the acute patients admitted to ward E2 and eligible for an AMU have a shorter length of hospital stay than 72 hours. More than three-quarters of the acute patients admitted to A2 in 2010 have a longer length of hospital stay than 72 hours. An AMU will lead to a shorter stay of those patients at the general wards.

The effect of patient type (elective vs. acute) on the experienced workload of nurses is very small. The experienced workload with an acute patient is somewhat higher than with an elective patient. In case of an AMU, no more unplanned acute patients will arrive at the general wards. The acute patients can be scheduled for transfer to a ward, so they become in a way elective patients. This however will not lead to a considerable lower experienced workload for the nurses.

4.2 Remarks amount and type of acute patients

Medical specialties with fewer admitted acute patients like oral surgery and ophthalmology (mostly admitted to E2) are the medical specialties at the general wards that will mostly be affected by implementing an AMU. These specialties have an overall shorter length of hospital stay, which is why fewer patients of these specialties will have to be admitted to one of the general wards. The medical specialties with a larger amount of admitted acute patients like internal medicine (mostly admitted to A2 and the UZ) have mostly patients with a longer length of hospital stay than 72 hours.

An AMU of 48 hours doubles the hours eligible for an AMU per ward compared to an AMU of 24 hours. When the maximum stay at an AMU extends to 72 hours, the hours eligible for an AMU increases with about 150%.

In case of an AMU of 24 hours, 113,301 hours of hospital stay would have been eligible for an AMU in 2010. For 48 hours and 72 hours, the amount of hours would have been 206,502 and 287,056 hours respectively. These hours would thus no longer end up at the six general wards.

A large amount of acute patients of the UZ (*N* = 1,740) would have been admitted to an AMU in 2010. The UZ admits more than a third (34.5%) of all the acute patients eligible for an AMU.

No study was found in the literature that also focused on the effects of an AMU on the specific amount and type of patients admitted to the general wards. Only the Vreelandgroep[3] stated that 50% of all patients admitted to the AMU will go home after the AMU and will not be admitted to a

ward, in case of an AMU of 48 hours. This study however showed that only 28.7% of all the patients admitted to the AMU have a shorter length of hospital stay than 48 hours.

4.3 Remarks experienced workload

One reason why Deventer Hospital considers to implement an AMU, is that the hospital wants to lower the experienced workload of the nurses at the wards. This study however showed that the experienced workload of the nurses is not much higher with the arrival of an acute patient than with an elective patient. A lower experienced workload will therefore not be accomplished by implementing an AMU.

A situation with the arrival of an acute patient at the ward and a busy ward occupation (situation 3) can be considered as the situation when an AMU is implemented at the hospital. Because an acute patient can be planned for arrival at the ward in case of an AMU, the occupation of the beds can be more efficiently planned and can result in a higher bed occupation. However, this higher bed occupation leads to a much higher experienced workload of the nurses according to the results of this study.

This study does show two ways a lower experienced workload of nurses at the general wards can be established: especially on the aspect 'temporal demand'. The nurses of the six general wards at the Deventer Hospital consider the temporal demand to be the most important aspect of the height of the experienced workload. Planning of when to admit new acute patients to the wards can lead to less time pressure for the nurses. In general, avoidance of transfers around dinner time may lower the experienced workload.

Another way to lower the experienced workload of nurses at the hospital, is a better administration of the medication lists. As mentioned earlier, nurses (N = 5) indicated that it is important to correctly administer the medication lists before the patient arrives at the ward. Then the nurses do not need to check the medication lists themselves.

4.3.1 Experienced workload of nurses in literature

The NASA-TLX questionnaire to measure experienced workload was originally developed for usage in aeronautics. More and more, the questionnaire is used in other areas. One study assessed NASA-TLX with regards to the subjective workload of cardiovascular critical care nurses. It concluded that the workload was correlated with the patient diagnosis, the number of days off of work and number of assigned patients[29]. Young and Hooper[30] conclude that the NASA-TLX could be used for a better assessment of workload in patient care. However, it is not yet widely used for assessing the workload of nurses. No other study is found with regards to the workload associated with the admission of patients. This study revealed that it is possible to also study the experienced workload regarding the admission of patients by means of the NASA-TLX questionnaire. However, it is not an easy questionnaire for the nurses, considering the comments of the nurses and the amount of partial responses.

The Vreelandgroep[3] stated that an AMU lowers the experienced workload of nurses. However, this study concluded the contrary: an AMU results in a higher ward occupation and thus a much higher experienced workload (§4.3).

4.4 Implications for Deventer Hospital

An AMU is probably not the solution to lower the experienced workload of nurses at the general wards at Deventer Hospital. The hospital can focus on better planning of transfers of acute patients from the emergency department to the general wards and a better administration of medication lists to establish a lower experienced workload in general.

Analyzing the acute patients admitted to the Deventer Hospital in 2010, which are eligible for an AMU, an AMU of 24 beds can be sufficient for the hospital in case of a maximum stay of 24 hours. On six days in 2010 (figure 12), all beds would then have been occupied. Experience with AMUs has shown that the overall length of hospital stay will be reduced by implementation of an AMU[5,8,9,10,11,15]. With a maximum stay of 48 hours or 72 hours at the AMU, a total amount of respectively 34 or 44 beds can be sufficient for the AMU, considering figure 13 and 14 and a possible reduction in the overall length of hospital stay.

4.5 Strengths and limitations of the study

This study tested a measure for experienced workload in the Netherlands among nurses. No other study has yet used the NASA-TLX to measure the experienced workload with regards to the admission of patients among nurses. This gives other hospitals in the Netherlands the possibility to also use this questionnaire to measure their experienced workload at the wards or even at other departments at the hospital. With the NASA-TLX, this study provides also a tool to measure the workload after implementation of an AMU at Deventer Hospital. This way, the results can easily be compared.

The two greatest advantages of the NASA-TLX questionnaire compared to other measures of experienced workload (e.g. the SWAT questionnaire) are the calculation of a specific score of workload and the possibility to compare different situations in workload.

The original version of NASA-TLX has been translated to Dutch to be measured among the nurses at Deventer Hospital. Also, the tasks of NASA-TLX have been changed into described situations to determine whether the experienced workload is different among elective patients or acute patients. This might jeopardize the validation of the original questionnaire. A few nurses stated in the questionnaire that they believed the questionnaire was difficult to fill out. This might be the reason why there were also partial responses.

Another situation could have been studied in the questionnaire: a situation when an elective patient arrives at the general ward and with a busy ward occupation. This can give insight in whether the effect of patient type on the workload is different with an average ward occupation than with a busy ward occupation.

The results of the experienced workload can be generalised to other hospitals in the Netherlands. The effect of patient type and ward occupation on experienced workload will probably be the same in other hospitals. The part of the amount and type of patients at Deventer Hospital is more difficult to generalize to other hospitals. Differences in size and sort of hospital (academic or specialistic) can affect the results.

Experience with AMUs has shown that an AMU shortens the overall length of hospital stay[5,8,9,10,11,15], because of the faster diagnostics and treatment of each patient. This gives uncertainty about the

results, because a shortening of the length of hospital stay may result in different percentages of patients with a shorter length of hospital stay than 24, 48 or 72 hours. The current method provides a good overview of the distribution of patients, their length of hospital stay and the medical specialties among the six wards and the UZ. A simulation model of the arriving acute patients might give more insight in the effects of an AMU at the hospital.

4.6 Further research

This study did not research the effects of an AMU on the quality of care for the patient. Nurses with a lower experienced workload might be less stressed and therefore provide better care for their patients. A suggestion for further research is to study the actual effects of an AMU on the quality of care, for instance by a pre-test before implementation of an AMU and a post-test after implementation of the AMU.

The experienced workload can again be measured when the AMU is present with the same NASA-TLX questionnaire. This way, the actual effects of an AMU on the workload can be studied. Is the experienced workload lower with an AMU than without an AMU?

The experienced workload of the nurses in Deventer Hospital can also be compared with the workload of nurses in other hospitals in the Netherlands, who already have an AMU. This can give insight in whether an AMU actually gives a lower experienced workload for the nurses at the general wards.

A simulation study can be done to study the effects of an AMU on the amount and type of patients admitted to the general medical wards in more detail. Many more things need to be considered, before actually implementing the AMU: the costs and benefits of an AMU and the personnel changes, for instance the education of special AMU-nurses.

Actually implementing an AMU at the hospital will show whether the found advantages and disadvantages in literature (table 1) actually will be realized, for instance the lower in-patient mortality, a reduction in the length of hospital stay and an increase in patients with a higher intensity of care at the wards.

This study only focused on the input of acute patients to the general wards. The output is also of great importance: are there enough beds available in the nursing homes? This problem is called “bed blocking”[31], when a usually elderly patient occupies a bed in the hospital, because there is no place at a nursing home. Figure 10 showed that acute patients of the medical specialty clinical geriatrics have an overall long length of hospital stay. These are the patients who may need to be admitted to a nursing home after the care in the hospital.

In conclusion, the changes in the amount and type of acute patients at the general wards and the experienced workload of nurses need to be assessed when considering to implement an AMU at a hospital. This study showed that the experienced workload of nurses is mostly dependent on the ward occupation. Wards with medical specialties with a shorter length of hospital stay will be affected the most by an AMU.

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APPENDICES

Appendix I – The questionnaire

Deze vragenlijst is bedoeld om inzicht te krijgen in wat voor u het meest invloed heeft op de werkdruk van verpleegkundigen op de verpleegafdelingen in het Deventer Ziekenhuis. Voornamelijk de werkdruk met betrekking tot spoedpatiënten wordt in kaart gebracht door middel van dit onderzoek.

Door het invullen hoopt het Deventer Ziekenhuis vast te stellen wat voor u als verpleegkundige een hoge werkdruk oplevert.

De vragenlijst begint met een aantal achtergrondvragen. Uiteraard worden de gegevens anoniem verwerkt.

1. Geslacht
   - Man
   - Vrouw

2. Wat is uw leeftijd?
   - Jonger dan 20 jaar
   - 20 – 29 jaar
   - 30 – 39 jaar
   - 40 – 49 jaar
   - 50 – 59 jaar
   - 60 jaar en ouder

3. Aanstelling
   - Verpleegkundige op 1 van de basisafdelingen: Minder dan 60% of 22 uur
   - Verpleegkundige op 1 van de basisafdelingen: Meer dan of gelijk aan 60% of 22 uur
   - Verpleegkundige Mobiflex: Minder dan 60% of 22 uur
   - Verpleegkundige Mobiflex: Meer dan of gelijk aan 60% of 22 uur
   - Anders; namelijk…

4. Op welke afdeling bent u (voornamelijk) werkzaam?
   - A2
   - B2
   - C2
   - D2
   - E2
   - G2

Aspecten van werkdruk

U krijgt nu telkens 2 begrippen te zien. Ieder begrip kan invloed hebben op de werkdruk.
In de tabel hieronder ziet u de uitleg van ieder begrip.

Begrip	Beschrijving
Mentale belasting	De hoeveelheid mentale activiteit die gevraagd wordt tijdens het werk (bijv. denken, beslissen, berekenen, herinneren) en de druk die dat met zich meebrengt.
Lichamelijke belasting	De mate van lichamelijke belasting tijdens het werk.
Tijdsbelasting	De hoogte van de tijdsdruk die u voelde door de snelheid of het tempo waarmee het werk moet gebeuren: een langzaam en kalm tempo of eerder een snel en stressvol tempo.
Uitvoering van verpleegkundige werkzaamheden	De mate van het succes in het uitvoeren van uw taken en de tevredenheid met uw prestaties.
Moeite	De moeite die u moest doen (lichamelijk en geestelijk) om de verpleegkundige werkzaamheden uit te voeren.
Frustratieniveau	De mate van onzekerheid, ontmoediging, irritatie, stress of ergernis tijdens de verpleegkundige werkzaamheden.

Welke van de twee heeft volgens u de meeste invloed op de werkdruk die u ervaart op de verpleegafdeling waar u voornamelijk werkzaam bent?

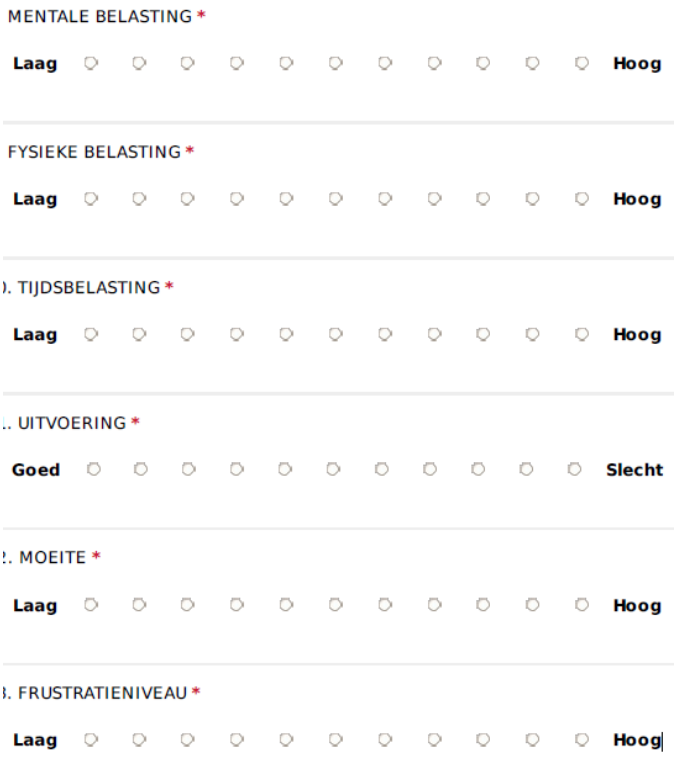
Mentale belasting	○	○	**Fysieke belasting**
Mentale belasting	○	○	**Tijdsbelasting**
Mentale belasting	○	○	**Uitvoering**
Mentale belasting	○	○	**Moeite**
Mentale belasting	○	○	**Frustratieniveau**
Fysieke belasting	○	○	**Tijdsbelasting**
Fysieke belasting	○	○	**Uitvoering**
Fysieke belasting	○	○	**Moeite**
Fysieke belasting	○	○	**Frustratieniveau**
Tijdsbelasting	○	○	**Uitvoering**
Tijdsbelasting	○	○	**Frustratieniveau**
Tijdsbelasting	○	○	**Moeite**
Uitvoering	○	○	**Frustratieniveau**
Uitvoering	○	○	**Moeite**
Frustratieniveau	○	○	**Moeite**

In het laatste gedeelte van deze vragenlijst worden 3 voorbeelden uit de praktijk vergeleken. Voor iedere situatie wordt u gevraagd aan te geven hoe hoog ieder aspect van werkdruk op dat moment was.

Situatieschets #1
Zou u zich de volgende situatie voor de geest willen halen (voor de afdeling waar u het meest werkt)?

Het is een **gemiddelde** dag op de afdeling wat betreft de hoeveelheid opnames en de bezetting. Ook de patiëntenbelasting is gemiddeld complex. Op een gegeven moment komt een **electieve** patiënt (gemiddeld complex) binnen en moet opgenomen worden op de afdeling.

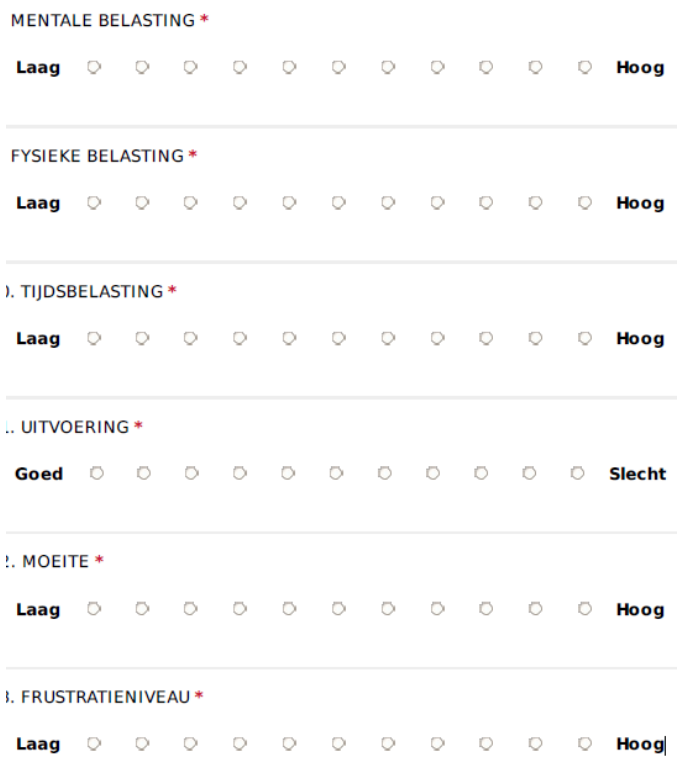
Geef voor ieder begrip van werkdruk aan hoe laag of hoog u deze vindt in dit voorbeeld.



Situatieschets #2

Het is een **gemiddelde** dag op de afdeling wat betreft de hoeveelheid opnames en de bezetting. Ook de patiëntenbelasting is gemiddeld complex. Op een gegeven moment wordt er via de officiële weg gebeld dat er een nieuwe **spoedpatiënt** (gemiddeld complex) opgenomen moet worden op de afdeling.

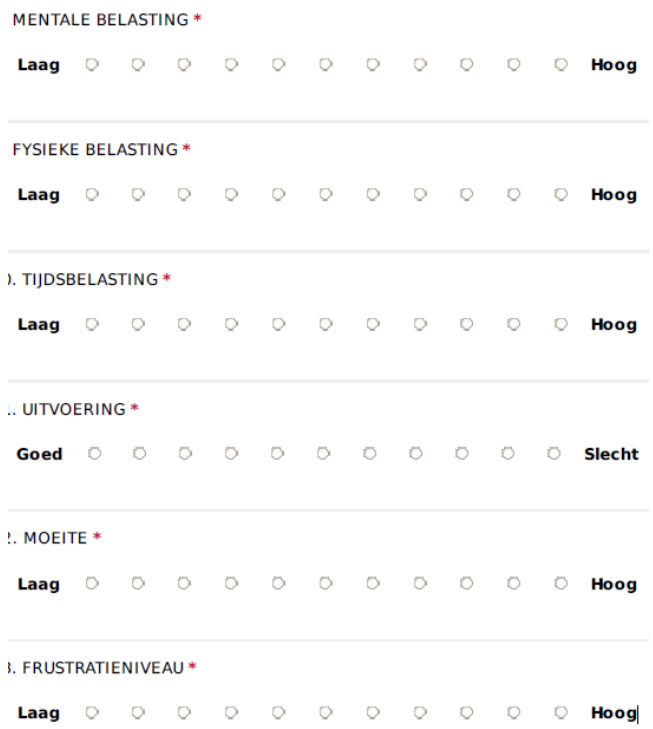
Geef voor ieder begrip van werkdruk aan hoe laag of hoog u deze vindt in dit voorbeeld.



Situatieschets # 3

Het is **druk** op de afdeling. Er zijn veel patiënten opgenomen en de patiënten die er liggen vereisen veel zorg. U wordt veel gestoord in uw werk door telefoontjes. Vervolgens wordt er via de officiële weg gebeld dat een **spoedpatiënt** opgenomen moet worden.

Geef voor ieder begrip van werkdruk aan hoe laag of hoog u deze vindt in dit voorbeeld.



Tot slot

Heeft u nog vragen en/of opmerkingen?

…….

Als u graag hebt dat ik contact met u opneem naar aanleiding van uw vraag/opmerking; kunt u hier uw e-mailadres vermelden.

…….

Appendix II – Descriptive statistics of the amount of acute admissions per day

Table 1 Descriptive statistics of the amount of acute admissions per day

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
N	664	940	863	846	805	910	662
Mean	12.8	18.1	16.6	16.3	15.5	17.2	12.7
Std. Deviation	3.7	4.4	4.0	4.1	3.4	4.1	4.5
Median	13.0	18.0	16.5	15.5	15.0	17.0	12.0
Minimum	4	10	6	8	7	9	5
Maximum	23	27	25	25	23	26	23

Appendix III – Distribution of the medical specialties

Table 2 Distribution of the medical specialties among the six wards and the UZ in 2010

Department	Medical specialty	N
A2	Cardiology	1
	Internal medicine	588
	Clinical geriatrics	4
	Gastroenterology	12
	Neurology	3
	Respiratory medicine	31
	Surgery	8
	Urology	2
B2	Dermatology	1
	Gynaecology and obstetrics	1
	Internal medicine	290
	Clinical geriatrics	156
	Gastroenterology	16
	Neurology	376
	Orthopedics	9
	Respiratory medicine	6
	Rheumatology	4
	Surgery	36
	Urology	18
C2	Gynaecology and obstetrics	2
	Internal medicine	22
	Clinical geriatrics	2
	Gastroenterology	356
	Neurology	3
	Orthopedics	7
	Respiratory medicine	7
	Surgery	398
	Urology	4

D2	Gynaecology and obstetrics	7
	Internal medicine	16
	Oral surgery	2
	Ear, nose and throat surgery	7
	Clinical geriatrics	4
	Gastroenterology	11
	Neurology	4
	Orthopedics	101
	Plastic surgery	7
	Respiratory medicine	12
	Rheumatology	1
	Surgery	360
	Urology	14
E2	Gynaecology and obstetrics	39
	Internal medicine	9
	Ear, nose and throat surgery	20
	Gastroenterology	9
	Neurology	1
	Ophthalmology	3
	Orthopedics	1
	Plastic surgery	12
	Respiratory medicine	26
	Surgery	135
	Urology	104
G2	Cardiology	28
	Gynaecology and obstetrics	1
	Internal medicine	43
	Ear, nose and throat surgery	3
	Clinical geriatrics	1
	Gastroenterology	12
	Neurology	5
	Ophthalmology	3
	Orthopedics	1
	Plastic surgery	2
	Respiratory medicine	342
	Surgery	17
	Urology	18

UZ	Anaesthesiology	2
	Cardiology	15
	Gynaecology and obstetrics	28
	Internal medicine	679
	Oral surgery	1
	Ear, nose and throat surgery	26
	Pediatrics	3
	Clinical geriatrics	15
	Gastroenterology	193
	Neurology	175
	Ophthalmology	1
	Orthopedics	69
	Plastic surgery	3
	Respiratory medicine	234
	Rheumatology	2
	Surgery	429
	Urology	71

Appendix IV – Distribution medical specialties in case of an AMU

Table 3 Distribution of the medical specialties in case of an AMU at Deventer Hospital in 2010

	Total amount of acute patients	< 24 hours	< 48 hours	< 72 hours
Anaesthesiology	2	2	2	0
Cardiology	44	15	16	26
Clinical geriatrics	182	7	14	158
Dermatology	1	0	0	1
Ear, nose and throat surgery	56	18	29	20
Gastroenterology	609	110	198	323
Internal medicine	1,645	314	450	1,068
Ophthalmology	7	4	7	0
Oral surgery	3	1	3	0
Orthopedics	188	35	48	128
Plastic surgery	24	16	19	5
Respiratory medicine	658	84	153	417
Rheumatology	7	1	1	5
Surgery	1,382	297	492	760
Urology	231	25	51	150

Appendix V – Descriptive statistics of the six aspects

Table 4 Descriptive statistics of the six aspects of workload in the pair-wise comparisons

	Mental demand	Physical demand	Temporal demand	Performance	Effort	Frustration level
N	109	109	109	109	109	109
Mean	2.7	1.6	4.0	2.4	1.7	2.6
Std. Deviation	1.3	1.4	1.1	1.4	1.4	1.7
Median	3	1	4	2	1	3
Minimum	0	0	0	0	0	0
Maximum	5	5	5	5	5	5

Appendix VI – Descriptive statistics of the three WWL scores

Table 5 Descriptive statistics of the three WWL scores

	WWL for situation 1 (elective patient – average ward occupation)	WWL for situation 2 (acute patient – average ward occupation)	WWL for situation 3 (acute patient – busy ward occupation)
N	109	109	109
Mean	44.6	48.8	76.6
Std. Deviation	19.3	20.1	14.9
Median	48	50	78.7
Minimum	0.0	0	17.3
Maximum	90	88	100