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A profile of European ICU nursing

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Abstract *Objective:* To evaluate major similarities and major differences between Western European countries in intensive care unit (ICU) nurse staffing, education, training, responsibilities, and initiative.

Design: A questionnaire was sent to Western European doctor members of the European Society of Intensive Care Medicine, to be passed on to the nurse-in-charge of their ICU.

Results: 156 completed questionnaires were analyzed: 49 % were from university hospitals, 26 % from university-affiliated hospitals, and 25 % from community hospitals; 42 % of the hospitals had more than 700 beds, 67 % of the ICUs had between 6 and 12 beds, and 54 % were mixed medical–surgical units.

Among British units, 79 % had more than three full-time nursing equivalents (FTE) per ICU bed, while in Sweden 75 % of units had less than two FTE/ICU bed. University hospitals had more nursing staff per bed than community hospitals. As regards training, 33 % of nurses fol-

lowed a training course before starting work on the ICU and 64 % after starting on the unit, and 85 % had easy access to continuing education, particularly in the university hospitals. In an emergency, more than 70 % of nurses regularly initiated oxygen administration, mask ventilation, or cardiac massage. In Sweden 100 % of nurses and in Switzerland 91 % of nurses regularly inserted peripheral intravenous catheters, but only 7 % of German nurses did. No German nurses and only 12 % of British nurses regularly performed arterial puncture, but in Sweden 75 % of nurses regularly did.

Conclusion: Even though the number of participants were limited, our questionnaire revealed variations in nurse staffing patterns among European countries and in their systems of training and education. Nurse autonomy also varies widely between countries.

Key words Nurse training · Nurse staffing · Nurse autonomy · Questionnaire · Intensive care units

Introduction

Intensive care medicine has come a long way since 1852 when Florence Nightingale first noted the need for a place where postoperative patients and other patients needing close attention could be watched. Intensive care units (ICUs) are now well-established areas of the

hospital providing critically ill patients with the advanced technology and specially trained staff necessary for intensive treatment and monitoring. Attempts are being made to create a degree of uniformity between ICUs, but notable differences still exist. Differences in unit structure and medical staffing have been highlighted in several recent studies [1, 2], but there is little infor-

mation available on the position of the ICU nurse in Europe. Well-trained and efficient nursing staff are essential for a unit to run smoothly and effectively. Limited resources make efficient use of nursing skills vital in providing quality intensive care for patients. With current economic constraints, it is increasingly important to be able to define and rationalize staffing levels and skills. We therefore designed a questionnaire intended to provide a profile of Western European ICU nursing. Our aim was to obtain basic information regarding levels of ICU nurse staffing, levels of ICU nurse training and education, and the extent of ICU nursing involvement in practical procedures. Having thus created a broad overview of European ICU nursing conditions, we sought to draw comparisons, and to highlight major differences, between the various European countries. The analysis of such differences may highlight shortfalls in nursing skills, education and staffing and provide a baseline for more uniform planning of ICU nurse training and provision.

Materials and methods

A questionnaire was sent to 460 Western European doctor members of the European Society of Intensive Care Medicine in May 1996. Only one doctor per hospital was contacted and was asked to pass the questionnaire on to the nurse in charge of the ICU. The questionnaire included sections on the demographics of the respondent's ICUs and on nursing practice, and several hypothetical clinical situations to try and assess the level of nurse autonomy. All questionnaires were anonymous. For comparisons between countries only the six countries which had each returned more than ten questionnaires (Table 1) were included. Results were analyzed by chi-square tests using an SPSS program. A p value < 0.05 was considered statistically significant.

Results

Altogether, 156 completed questionnaires were received and analyzed, representing an overall response rate of 34% (Table 1): 76 of 155 responses (49%) were from university hospitals, 41 of 155 (26%) from university-affiliated hospitals, and 38 of 155 (25%) from community hospitals. Sixty-five of 154 hospitals (42%) had more than 700 beds. Among ICU units, 104 of 156 units (67%) had between 6 and 12 beds, and 84 of 155 (54%) were mixed medical-surgical units (Table 2); 121 of 155 units (78%) had a doctor present 24 h a day.

Nurse staffing

The numbers of full-time equivalent (FTE) nursing staff per ICU bed varied as did the percentage of registered nurses (Fig. 1, 2). There were considerable variations

Table 1 Distribution and response to questionnaires by country

Country	Number sent	Number returned (%)
Austria	16	1 (6)
Belgium ^a	41	30 (73)
Denmark	11	1 (9)
Finland	9	6 (67)
France	69	7 (10)
Germany ^a	80	14 (18)
Greece	17	7 (41)
Ireland	6	3 (50)
Italy	33	5 (15)
Luxembourg	2	1 (50)
The Netherlands ^a	37	14 (38)
Norway	5	0 (0)
Portugal	9	7 (78)
Spain	20	3 (15)
Sweden ^a	22	12 (55)
Switzerland ^a	23	11 (48)
United Kingdom ^a	60	34 (57)
Total	460	156 (34)

^a Countries returning more than ten questionnaires and included in statistical analysis for comparisons between countries

Table 2 Principal demographic data of the respondents. Percentages in parentheses

Type of hospital	
University	76/155 (49)
University affiliated	41/155 (26)
Community	38/155 (25)
Number of hospital beds	
< 250	16/154 (10)
250–400	24/154 (16)
401–700	49/154 (32)
> 700	65/154 (42)
Number of ICU beds on unit	
< 6	12/156 (8)
6–8	64/156 (41)
9–12	40/156 (26)
13–18	18/156 (12)
> 18	22/156 (14)
Type of ICU	
Medical	11/155 (7)
Surgical	26/155 (17)
Pediatric	15/155 (10)
Mixed medical-surgical	84/155 (54)
Other	19/155 (12)

between countries (Table 3), with 27 of 34 of British units (79%) having more than three FTE/ICU bed, but 9 of 12 Swedish units (75%) having less than two FTE/ICU bed ($p < 0.01$). University hospitals had more FTE/bed than community hospitals (36/76 university hospitals $>$ three FTE/bed; 13/41 university affiliated hospitals $>$ three FTE/bed; 13/38 community hospitals $>$ three FTE/bed; $p < 0.04$). The majority of units were staffed predominantly by registered nurses (Table 3)

Fig. 1 Variation in numbers of full-time equivalent nursing staff per ICU bed

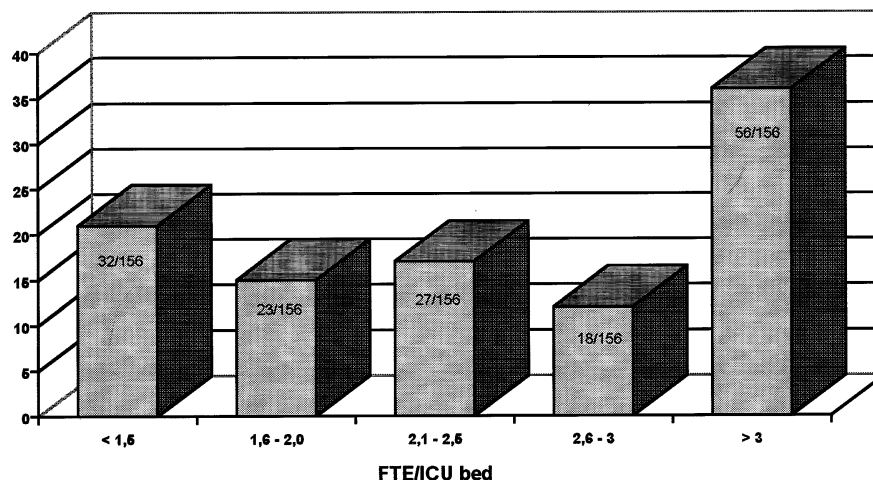
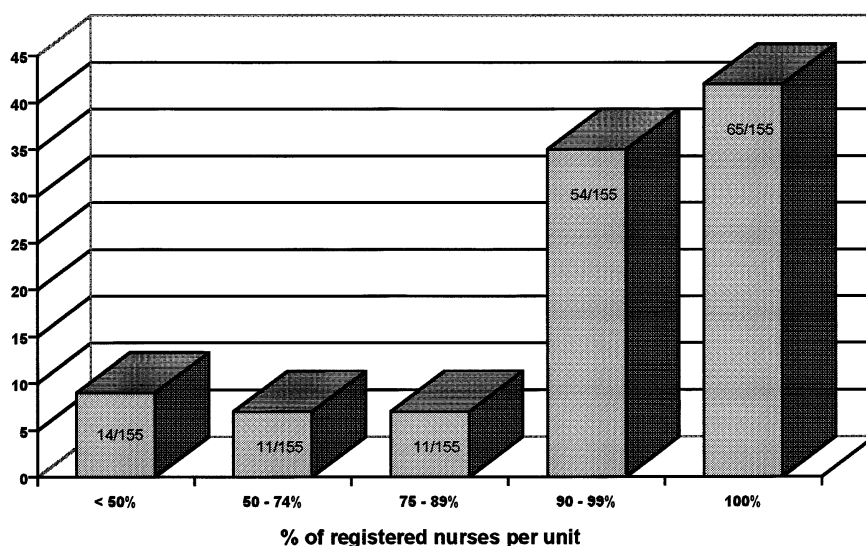


Fig. 2 Variations in numbers of registered nurses per unit



with the exception of Sweden, where in 4 out of 12 units (33%) less than 50% of the nurses were registered ($p < 0.01$).

Nurse training

Among the respondents, 52 (33%) replied that nurses followed a specific training course before commencing work in the ICU, this figure varying considerably among countries, being highest in Sweden and lowest in Belgium (Fig. 3). One hundred of the respondents (64%) reported that new ICU nurses received special training after starting in the unit, again showing variations between countries with the highest rate in the United Kingdom and the lowest in Belgium (Fig. 3). Interestingly, the number of nurses receiving training courses was the same for university, university-affiliated, and

community hospitals. In 132/155 units, nurses (85%) have easy access to continuing education, this being more common in the university hospitals (university: 70/76 (92%); university affiliated: 32/40 (80%); community: 29/38 (76%); $p < 0.05$). In units with access to continuing education the amount varied from less than 10 h per year in 16/132 (12%), 10–25 h in 43/132 units (33%), 26–50 h in 39/132 units (30%), and > 50 h in 34/132 units (26%).

Nursing practice

Nurse participation in an emergency varied, with 134 of 155 (86%) units reporting that nurses regularly initiate oxygen administration, 119 of 155 (77%) units reporting that nurses regularly initiate cardiac massage and 110 of 156 (71%) units reporting that nurses regularly initiate

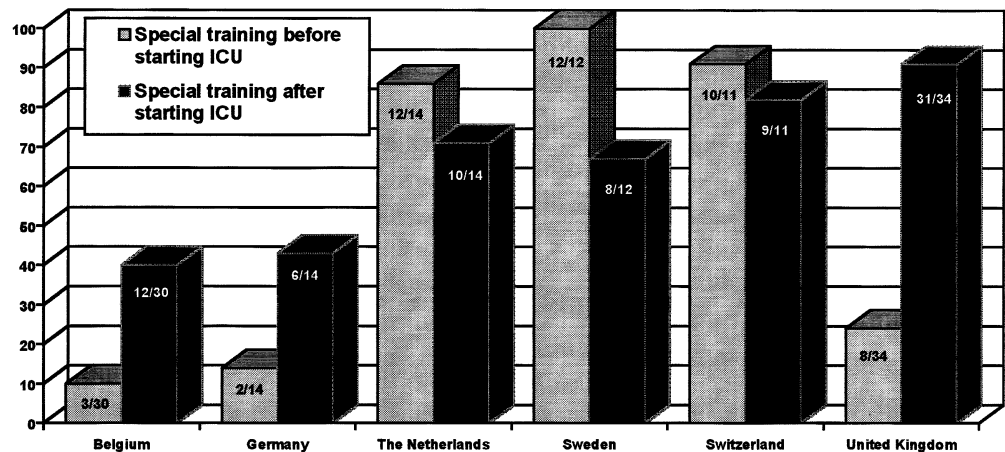
Table 3 Full-time nursing equivalents *FTE* per ICU bed, and percentage of registered nurses (RN) per unit, according to country

	FTE/ICU bed			RNs per unit (%)			
	< 2	2–3	> 3	< 50	50–74	75–89	> 90
Belgium	11/30	15/30	4/30	0	1/30	3/30	26/30
Germany	3/14	10/14	1/14	1/14	0	1/14	12/14
The Netherlands	4/14	2/14	8/14	0	0	2/13	11/13
Sweden	9/12	1/12	2/12	4/12	4/12	1/12	3/12
Switzerland	1/11	4/11	6/11	1/11	0	0	10/11
United Kingdom	6/34	1/34	27/34	0	0	0	34/34

Table 4 Number of nursing units where nurses regularly, occasionally or never perform routine procedures (% in parentheses)

Procedure	Regularly	Occasionally	Never
Electrocardiography	120/154 (78)	23/154 (15)	11/154 (7)
Adjustment of vasoactive agents according to arterial pressure	78/152 (51)	48/152 (32)	26/152 (17)
Adjustment of mechanical ventilation	72/156 (46)	60/156 (38)	24/156 (15)
Removal of chest tubes	64/148 (43)	24/148 (16)	60/148 (41)
Extubation	90/156 (58)	36/156 (23)	30/156 (19)
Arterial puncture for blood sampling	52/155 (34)	30/155 (19)	73/155 (47)
Insertion of peripheral i. v. catheter	91/156 (58)	35/156 (22)	30/156 (19)
Insertion of arterial catheter	7/153 (5)	11/153 (7)	135/153 (88)
External pacemaker adjustment	13/137 (9)	48/137 (35)	76/137 (55)
Insertion of Foley catheter	134/151 (89)	7/151 (5)	10/151 (7)
Drug injection into an epidural catheter	61/143 (43)	40/143 (28)	42/143 (29)
Adjustment of i. v. electrolytes	52/155 (34)	42/155 (27)	61/155 (39)
Participation in the decision to stop life support	58/153 (38)	53/153 (35)	42/153 (27)

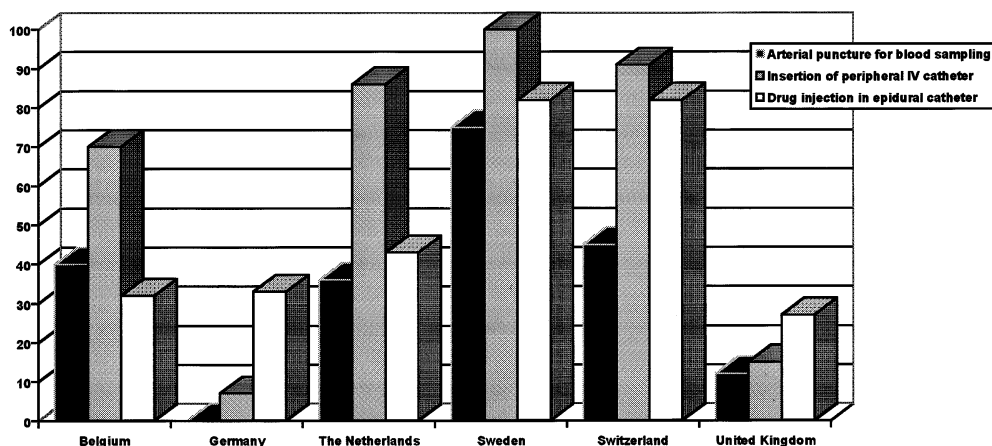
Fig. 3 Variations in the provision of ICU nurse training in six European countries



mask ventilation in the absence of a doctor. However, defibrillation and administration of vasoactive drugs were less frequently initiated by the nurse. Cardiac defibrillation was more likely to be initiated by the nurse in a community hospital than in university or university-affiliated hospitals (community: 32/38 (84%), university-affiliated: 29/41 (71%), university: 48/76 (63%); $p < 0.02$). Involvement in routine procedures varied

considerably according to the task (Table 4), with only 7 of 153 (5%) of units reporting that nurses regularly insert arterial catheters, 52 of 155 (34%) units reporting that nurses regularly perform arterial puncture for blood sampling, 91 of 156 (58%) units reporting that nurses regularly insert intravenous catheters, and 134 of 151 (89%) units reporting that nurses regularly insert Foley catheters. There were also considerable variations

Fig. 4 Percentage of respondents regularly performing arterial puncture, insertion of peripheral i. v. catheter, or drug injection in to an epidural catheter, according to country



between countries in nursing practice, with Swedish and Swiss nurses generally carrying out more procedures than their British or German counterparts (Fig. 4).

Clinical situations

A situation was presented (see appendix) of a 69-year-old man with severe sepsis. Despite a dopamine infusion, his blood pressure remains low and his central venous pressure is 17 mm Hg. The responses showed that 17 of 142 respondents (12%) would increase the dopamine infusion and recheck the blood pressure, telling the doctor later; 48 (34%) would increase the dopamine and call the doctor immediately; 77 (54%) would call the doctor for advice. In a second situation, on a night shift at 11 p.m., a patient with acute vascular disease, but no history of respiratory disease, is unable to sleep. Responses showed that 16 of 143 respondents (11%) would give a sleeping tablet without informing the doctor and record it in the nursing notes; 25 (17%) would give a sleeping tablet and tell the doctor later; 102 (71%) would call the doctor for advice. The response of the nurses was not significantly different in units with a doctor present 24 h a day to units with less medical presence.

Discussion

ICU nurses provide essential, highly concentrated patient care and form a vital part of the ICU team. Good nursing staff, at sufficient levels for the number of patients, make a real difference to the quality of ICU care [3] but, in today's climate of financial restrictions, can be considered an expensive resource. There is thus a need to define the optimal level of nursing staffing, training, and practical involvement in patient care. The aim of this study was to provide initial information on

the profile of ICU nursing in Europe. Using the database of the European Society of Intensive Care Medicine (ESICM), we identified and contacted 460 ICUs, 156 of which returned completed questionnaires. The 34% response rate obviously imposes limitations on the interpretation of the data obtained, although we feel the data are representative of the general situation in Western Europe: the variety in the size and type of ICUs involved in the analysis provided a good cross-section of different units, and, although countries were not uniformly represented, questionnaires were received from 16 different countries. The low response rate may have been, in part, related to language barriers as reflected by generally lower response rates from countries in southern Europe than from those in the north (Table 1).

We sought to define the ICU nursing profile in terms of staffing levels, nursing training, and education and nursing autonomy and involvement in practical patient care. Adequate staffing levels are necessary to ensure continuing quality patient care and recent guidelines have recommended between two and six FTE/ICU bed, depending on the level of intensive care being given [4]. Attempts to limit expenditure may include employing fewer nurses or replacing registered nurses with less qualified staff. Reduced staffing levels can, however, lead to ICU bed closures and refused admissions. In one study of ICUs in the United Kingdom [5], 28% of ICU beds were reported to be closed due to insufficient nursing levels. In our study, the variations in levels of staffing were considerable, with more than one-fifth of units having less than 1.5 nursing FTE per bed. Such variations in levels of staffing may in part be related to financial budgeting, as well as to different regional and cultural views on the role of the ICU nurse. Wide variations in levels of staffing between individual units were similarly highlighted by a small study of 22 units in the United Kingdom [4]. A recent study in Greek ICUs found the average number of FTE/ICU

bed was 2.6, and 54% of nurses were not registered or were assistant nurses [6]. A study by Reis Miranda [7] of European ICUs found a similar wide variation among countries to our study, with Denmark having the lowest staffing level of 1.2 nurses per bed, followed by Sweden and France with 1.9, and the highest staffing levels were in the United Kingdom with 4.2 nurses per ICU bed. In our study, Swedish units in particular had low levels of staffing and also had the highest level of non-registered nurses on their units. Somewhat surprisingly, therefore, Sweden was also the country where nurses were more likely to insert i. v. lines and perform arterial puncture. This may be related to fewer Swedish units having a 24-h doctor present, nurses therefore being required to perform tasks more commonly assigned to the doctor in other hospitals. ICUs in the United Kingdom had the highest number of nurses per ICU bed and this may be related to the high proportion of smaller units in the United Kingdom [8] and thus a sicker patient population, requiring higher nurse:patient ratios. With higher levels of staffing, one might expect British nurses to be more involved with invasive procedures, but this was not the case.

It is interesting that in Sweden all nurses undergo a special training program before starting work in the ICU, perhaps related to the higher percentage of auxiliary nurses. In Belgium and Germany, less than one-sixth of nurses underwent a pre-ICU training course and these countries also had poor rates of post-ICU training. Access to continuing education was generally better, although in more than one in ten of those units with access, it was limited to less than 6 h per year. Perhaps surprisingly, university hospitals were no better than community hospitals at providing training courses, although access to continuing education was better. The ICU is a highly specialized area of the hospital where critically ill patients are monitored and often treated with complex and technically involved equipment. It is surprising that new ICU nurses are placed in such an environment with no specific training beyond that which they may have picked up during their student attachments. The lack of knowledge of essential procedures such as advanced cardiopulmonary resuscitation and pulmonary artery catheter use by intensive care nurses has been highlighted and the need for initial training and frequent updates stressed [9, 10]. Adequate and continuing training courses reduce stress levels and enable the nurse to work more efficiently [11, 12], and regular assessment and evaluation of ICU nurses have been recommended to ensure a continuing quality of nursing care [13, 14]. The need for ICU nurses to participate actively in continuing education programs has been highlighted by several international groups [5, 15]. Suggestions have been made with regard to providing some degree of standardization of ICU nurse training and continuing education [14], but there appears as yet

to be little uniformity between units at either the national or the international level.

ICU nurse participation in what perhaps have traditionally been seen as procedures for the medical staff varies considerably. In the ICU emergency environment almost a quarter of nurses rarely or never initiate basic cardiac massage or mask ventilation. As units increase in size, the ability of nurses to perform some of the more basic of these tasks without a medical presence will lead to more efficient use of ICU staff time. Nurses may value more direct involvement in patient treatments and improving skills can increase motivation. Nurses are still very dependent on the doctor for even fairly simple decisions regarding patient care, although various factors including local hospital policy, the requirements of professional nursing bodies, and problems with medicolegal responsibility may affect this issue.

There are few published data available on the ICU nursing standards in Europe and we believe this survey provides useful information, highlighting significant differences in the staffing, training, and role of the ICU nurse across Europe. The information should, however, be considered in the light of certain important limitations: first, the small number of ICUs involved which could impose a degree of bias to the results with more responses from motivated units with high levels of staffing and training. Although the results were obtained from a variety of units of different size and type limiting the likelihood of bias, if such an effect were present, the profile we have outlined would represent the best possible situation and levels of staffing and training could therefore be considerably worse than suggested by this study. Second, some of the questions employed general, even rather vague, terms such as "special training" and "easy access", which are subject to individual interpretation, and could thus potentially have influenced the results. A third factor is that there may be differences in the training and education of nurses between countries, which could potentially account for some of our findings. This would indeed be interesting to investigate and may provide valuable additional information but was beyond the scope of the present study.

Nevertheless, this survey provides an initial and important insight into the profile of ICU nursing in Western Europe. Such studies could be useful in the development of European standards or guidelines for ICU nurses by international bodies such as the ESICM. Individual countries could focus on specific areas where they appear to compare less favorably with others and act to improve the situation for their ICU nurses

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Appendix

- A. How many nurses (in full-time equivalents) are working per ICU bed (including head nurses)?
1. ≤ 1.5 2. 1.6–2 3. 2.1–2.5 4. 2.6–3 5. > 3
- B. How many members of the nursing staff are:
Registered nurses
1. 100% 2. 90–99% 3. 75–89% 4. 50–74% 5. $< 50\%$
Auxiliary or assistant nurses
1. 0% 2. 1–10% 3. 11–25% 4. 26–50% 5. $> 50\%$
- C. In your country do the ICU nurses follow a special training program before working in the ICU?
1. Yes 2. No
- D. Do newly employed ICU nurses receive a special training course in your ICU?
1. Yes 2. No
- E. Do the ICU nurses have easy access to continuing education (internal and/or external)?
1. Yes 2. No
If yes, how many hours a year?
1. < 10 h 2. 10–25 h 3. 26–50 h 4. > 50 h
- F. How many hours a day is a doctor physically present in your unit (or sleeping close to the ICU at night)?
1. < 6 h 2. 6–12 h 3. 13–18 h 4. 19–23 h 5. 24 h
- G. In emergency situations, does the ICU nurse initiate the following in the absence of an ICU doctor?
1. Regularly 2. Occasionally 3. Never
Cardiac defibrillation, cardiac massage, oxygen administration, manual mask ventilation.
- H. Does the ICU nurse perform the following?
1. Regularly 2. Occasionally 3. Never
Arterial puncture for blood sampling, insertion of peripheral i. v. catheter, drug injection in to an epidural catheter.
- I. A 69-year-old male patient has severe sepsis due to extended bronchopneumonia. Despite an 8 $\mu\text{g}/\text{kg}$ per min dopamine infusion, his blood pressure is 80/50 mm Hg, his central venous pressure is 17 mm Hg.
What do you do?
1. Increase the rate of dopamine infusion, check arterial blood pressure, and inform the doctor when you see him/her
2. Increase the dopamine infusion and call the doctor immediately
3. Call the doctor to ask what to do
- J. You are working a night shift. It is 11 p.m. Your patient with acute vascular disease (no history of respiratory disease) can't sleep.
What do you do?
1. Give him a sleeping pill and record it in the nursing notes or the bedside chart
2. Give him a sleeping pill and tell the doctor when he calls later
3. Call the doctor first

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