

# The future role of nurse anaesthetists in Swedish prehospital emergency care

Kenneth Kronohage<sup>1</sup>, Karin Linder<sup>2</sup>

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<sup>1</sup> Ulfabgruppen AB, Sweden

<sup>2</sup> Lund University, Faculty of Medicine, Department of Nursing, Sweden

**Correspondence**  
Kenneth Kronohage  
Ulfabgruppen AB  
Box 211  
SE-532 25 Ulricehamn, Sweden  
E-mail: kenneth.krinihage@ulfab.se

**ABSTRACT:**

During the recent years, there has been an ongoing discussion about the future role of hospital based Nurse Anaesthetists in Swedish prehospital emergency care. Emergency cars manned with nurse anaesthetists have been active for more than 20 years. During this period it has never been demonstrated, scientifically or objective, that cars manned with other competences - including physicians - could extend the medical care further to the critical ill patient. In the year 2002, 39.9% of the Swedish ambulance personnel were registered nurses. Twelve years earlier, 1990, only 5.2% were registered nurses. The increasing number of registered nurses in Swedish ambulances can make a change in hospital based Nurse Anaesthetist's participation in pre-hospital emergency care. Due to this reason, all departments of anaesthesia in Sweden were encouraged to answer an inquiry placed on the Internet. The results clearly demonstrate that the participation of the nurse anaesthetist in the pre-hospital medical care is widespread (77% of departments). Despite that other nurses had a marked increase in participation during the last few years and despite the fact that there exists a special ambulance nursing care training, 91% of the departments considered that their nurse anaesthetists would participate in the pre-hospital care within five years.

**KEYWORDS:** Nurse Anaesthetists, Prehospital, Emergency Care

**Introduction**

During the recent years, there has been an ongoing discussion about the future role of hospital based Nurse Anaesthetists in Swedish prehospital emergency care (ambulance, emergency car, emergency teams and helicopter). The Swedish National Board of Health and Welfare demands that after October 2005 there must be at least one registered nurse present when pharmaceutical drugs are administrated in ambulances. In the year 2002, 39.9% of the Swedish ambulance personnel were registered nurses (12). Twelve years earlier only 5.2% were registered nurses (13).

The increasing number of registered nurses in Swedish ambulances can make a change in hospital based Nurse Anaesthetist's participation in pre-hospital emergency care. Maybe such a change already has occurred?

**Background**

The concept "pre-hospital emergency care" normally stands for the medical attention and care given in ambulances and helicopters, but is also, in a widened aspect, applicable on all pre-hospital medical care. Ambulance medical care, being a subdivision of pre-hospital medical care, has originally derived from the military medical attendance. It was mainly a transport organization up to the 1960s, when a 3-week basic paramedic course was given to the staff. During the 70's, this

course was extended to 7 weeks and during the 80's, it was further elongated to 20 weeks (3, 8).

Some experimental activities like emergency cars and ambulances manned with nurse anaesthetists - or from time to time manned with physicians - took place during the 70's and 80's at several places in Sweden (8).

An emergency car is defined as a passenger car registered as a rescue vehicle. The emergency cars are called upon at the same time an ambulance is needed for emergency cases. The cars are often manned with a nurse anaesthetists and a paramedic. The car is equipped with advanced medical supplies and communication equipment. The emergency car is not intended for patient's transportation but furnish the ambulance medical services with superior medical competence where it is most needed at any given time (16).

In the mid 90's the Swedish National Board of Health and Welfare (BHW) emphasizes that the same standards regarding security in diagnostics and therapy as in hospital medical care, should be applied for ambulance medical care. The carrying out of qualified medical procedures requires a minimum level of a registered nurse with pre-hospital care experience, plus an additional training course in ambulance medical care. For duty on the emergency car, an additional course in anaesthesia is desirable (9).

The recommendation from the BHW regarding the nurse's competence on emergency car duty was withdrawn by the statute 1999:17. The minimum level of education needed for medical treatment in pre-hospital care will be equivalent to the level of a non-specialized registered nurse, valid from October 2005. Today there are no statutes or recommendations from the BHW regarding the presence of nurse anaesthetists in pre-hospital medical care. At the same time, the BHW draws attention to the fact that during 2002 approximately 55% of the nurses on duty in pre-hospital medical care lack additional training in ambulance-, anaesthesia- or Intensive Care Unit (ICU) medical care (10, 12).

Jonasson (4) emphasizes that leading politicians as well as several Board of Medical Directors do not seem to understand the differences in competence regarding a nurse specialized in general medical care and a nurse anaesthetists. Jonasson also states that nurse anaesthetists are used to a self-governed work, including keeping free airways, giving pain relief with pharmaceutical products like Ketamine and to intubate patients with skull injuries.

One condition is needed for the nurse to keep up this self-governed work – a list of general directives for pharmaceutical administration issued by the responsible physician (11).

An increased level of patients surviving skull injuries and undergoing pre-hospital intubation has been reported by Winchell and Hoyt (19). They studied endotracheal intubation performed by San Diego paramedics.

This result is contradictory to what Murray et al (6) found. Patients with pre-hospital intubation and severe skull injuries had a significantly higher risk of lethal outcome compared to non-intubated and failed-to-intubate patients. In this study, persons without the nurse anaesthetists training performed the endotracheal intubations.

Suserud (20) demonstrates that both ambulance head physicians and paramedics seem to regard anaesthetic or intensive care nurses as the best skilled and there exists an understanding for the need of an increased number of nurses in the pre-hospital activity.

Pain and pain relief has been widely studied on many emergency wards. A great number of studies demonstrate that insufficient pain relief is a common occurrence despite the fact of a plethora of different analgesics available. Based on this finding it is presumed that the situation in the pre-hospital environment is similar. White et al (18) found that only 1.8% of patients with extremity fractures have received any kind of analgesia during pre-hospital care under conditions similar to the Swedish condition.

Adequate pain relief to patients with severe injuries may be difficult to manage for many reasons, and may become a secondary goal for the caregiver, as life-threatening situations may evolve which must be given highest priority. However, since pain may affect the natural cause of the trauma and

indeed affects the mortality rate, adequate pain relief plays an important role in the general care taking process (17).

The anaesthetic agent Ketamine given at a low dosage will induce analgesia while consciousness remains unaffected. Given at higher dosage levels, the agent will cause anaesthesia. Ketamine is very well suited for the treatment of trauma patients with hypovolemic shock. Ketamine given at low dosage levels is well fitted as a replacement for morphine in acute situations (1).

The Swedish county of Jämtland has since the mid-70's, a helicopter manned with nurse anaesthetists. A six-month prospective study underlines the need for both professional nurse anaesthetists and the helicopter in advanced pre-hospital medical care. Compared to regular ambulance based medical care, 3% of the patients had better prognosis for a full recovery and 2% of the patients received a direct life saving treatment (2).

The trend towards more nurses manning ambulances may affect the commitment of the nurse anaesthetist in the pre-hospital medical care and maybe such an influence already has taken place. If the presence of nurse anaesthetists will decrease in favour of the presence of other specialized nurses, there is an evident risk of non-exploitation of the unique competence of the nurse anaesthetist and for these reasons it was of interest to investigate the prehospital emergency care commitment of nurse anaesthetist in a past, current and future perspective. Areas such as organization, business activity, education and future development need to be analysed if a holistic description of the commitment should be given.

## Method

All Board of Medical Directors in Sweden were asked, by email, for valid email addresses to their departments of anaesthesia. All answered, and after a revision regarding supplementary details, addresses were received to 67 departments of anaesthesia in Sweden. Of these, 63 had valid email addresses and four departments had postal addresses only.

The 63 departments having valid email addresses received an email where the head of the department was encouraged to answer an inquiry placed on the Internet. The remaining four departments received the inquiry by regular post. The Internet based inquiry was protected by a password, sent by email to the recipients. The inquiry had headings such as Organization, Business Activity, Education and Future Development and consisted of 20 questions with both open and restricted answer alternatives.

By using a regular postal inquiry, a larger material may be collected and there is no need to limit the geographical area. The disadvantage of a postal inquiry, according to Polit and Hungler (7), is that a postal inquiry often results in a low answering level.

Therefore, in this study an Internet based inquiry was used. The answer readiness was 56 (84%) of the departments. The 56 departments of anaesthesia employed 1,836 nurse anaesthetists.

### **Ethics**

The study has not affected patients or any individual staff, and is approved by the Committee of Research Ethics at the University of Lund (LU 645-01). Due to the demand for confidentiality, the identity of hospitals, departments or individuals are withheld. All participation is based on voluntariness.

### **Data analysis**

Data from the restricted answers was processed with the statistic method "Anova" by the statistic program SPSS version 12.0 and a P-value < 0,05 were considered significant.

The results from the open answer alternatives were categorized and a frequency analysis was made. Verbatim quotations from the open alternatives are used to illuminate various aspects under the results.

## **Results**

### **Organization**

Of totally 56 answering departments, 43 (77%) stated that their nurse anaesthetists took part, in any form, in the pre-hospital medical care. Thirty-eight departments mentioned the number of nurse anaesthetists also active in pre-hospital care. Twelve of the departments (32%) had all (100%) of the nurse anaesthetists on pre-hospital care duty. The 1-50% and 51-99% on pre-hospital duty levels were found on equally large parts – 13 (34%) of the departments. No significant differences were found in the number of employed nurse anaesthetists (size of departments) and the level of participation in pre-hospital medical care.

The 43 departments, participating in pre-hospital care with nurse anaesthetists, mentioned that an emergency car was manned by 11 (26%) of the departments. A helicopter was manned by 13 (30%), ambulances (as resources on code red alarm) by 17 (40%), ambulances (as resources on transportation to another hospital) by 31 (72%) and participation in medical emergency teams by 32 (74%). The manning with nurse anaesthetists on a 24h-7days/week level took place at 39 (91%) of the departments. The remaining four departments (9%) manned the pre-hospital care during office hours only (2 departments) or under extended shift hours, 0700 - 2300 (2 departments).

The question regarding when the participation in pre-hospital care commenced was answered by 39 departments. Two departments (5%) started in the 60s, six departments (15%) in the 70s, 20 departments (51%) in the 80s, eight departments (21%) in the 90s and three departments (8%) commenced from 2000 and onwards. The median year for commencement was 1984.

All 43 departments described the participation of the nurse anaesthetists during the past five years. Four departments (9%) had a considerable increase, twelve departments (28%) noted an increase, 17 departments (40%) noted an unchanged deployment, seven departments (16%) a decrease and three departments (7%) a marked decreased level of deployment. No statistic significant levels of differences were detected.

### **Business Activities**

The possibility for nurse anaesthetists to administrate pharmaceutical drugs by the means of "general directives" was given by 30 (70%) of the departments. Four departments (9%) stated that drugs were administrated after telephone consultation.

Four departments (9%) administrated the drugs by directives from the dispatching physician. Three departments (7%) always had a physician together with the patient. Two departments (5%) noted no reason why "general directives" were not in use.

Examples of pharmaceutical (anaesthetic) drugs included in the "general directives" exceeding the "standard emergency drugs" like Morphine, Furosemide were: Suxamethon, non depolarization relaxantia, Thiopentalsodium, Propofolium, Ketamine, Fentanyl, Alfentanil, Efedrinhydrochloride, Lidocaine hydrochloride, Glycopyrron Bromide, Methyl Prednisolone and Midazolam.

Thirty-eight departments (88%) stated that the nurse anaesthetists might add medical treatments to the pre-hospital care that no other specialized nurse (ICU or ambulance care nurse) are allowed to perform. "Endotracheal intubation needs skills that no other nurse category have. All situations where this skill is needed, cardiac arrest, drowning, high voltage injuries etc, also need the presence of a nurse anaesthetist."

However, five departments (12%) had an opposite opinion. "This may be a philosophical question. The nurse anaesthetist may be technically more skilled to maintain free airway and access to veins, but this has never been demonstrated in Sweden. In all other aspects, the ambulance care specialist nurse is better skilled for the task. The long and meritorious actions of nurse anaesthetists in pre-hospital care is mostly a consequence of the fact that we until recently had no education for ambulance specialist nurses, but had to take the best we had at that time. Now we have training for ambulance care specialist nurses. The need for nurse anaesthetists in pre-

hospital medical care should decrease dramatically." Table 1 identifies the categories of comments to the answers.

Forty-two departments answered the question if there was any statistic follow up or evaluation on the nurse anaesthetist's work. Sixteen departments (38%) answered "yes" and 26 departments (62%) answered "no".

Table 1. Comments on that the nurse anaesthetists could add medical treatments to the pre-hospital care that no other specialized nurse (ICU or ambulance care nurse) is allowed to perform.

Categories (n=10)	Frequency (n=59)
Experience of gaining airway with intubation	29
Experience of performing anaesthesia	11
Work self-governed	4
Experience of gaining access to blood vessels.	3
Experience of aggressive fluid therapy	3
Experience of making fast decisions regarding breathing and circulation.	3
Experience of potent pharmaceutical drugs	3
Experience of unconscious patients	1
Supervision	1
Ambulance care nurse is more appropriate	1

### Education

Thirty-six departments (84%) answered that their nurse anaesthetists had adequate education for pre-hospital medical care. Seven departments (16%) answered the very opposite. Deeper education in pre-hospital care giving was supplied by 27 departments (63%) while 16 departments (37%) provided no such education.

### Future development

Fifty-one (91%) of 56 answering departments believe that their nurse anaesthetists will be a part of the pre-hospital medical care within the next five years. Five departments (9%) had an opposite apprehension. No statistic significant differences were detected between size of departments and participation in various pre-hospital activities.

The 51 departments suggested that the nurse anaesthetists would work in areas like

- Emergency cars 14 (28%)
- Helicopter 19 (37%)
- Ambulance (on code red alarm) 19 (37%)
- Ambulance (on transportation to another hospital) 33 (65%)
- Emergency team 38 (75%)

Some comments to that nurse anaesthetist will be a part of the pre-hospital medical care within the next five years:

Table 2. Comments from the departments if there was an interest among their nurse anaesthetists to participate in the future pre-hospital medical care.

Categories	Frequency	Categories	Frequency	Categories	Frequency
“Yes”		“Hesitation”		“No”	
(n=9)	(n=21)	(n=6)	(n=9)	(n=2)	(n=4)
Man Emergency Car	5	To some part	2	Lack of employees	3
There is a great interest	4	Not everyone likes to participate	2	Anaesthesiologist is a first hand choice	1
Rotation anaesthesia-ICU and ambulance	3	Educational efforts needed	2		
Contributes to alternation	3	Related to individuals	1		
Man Helicopter	2	Not everyone has physical abilities	1		
Trauma is of high interest	1	Subjective judgment of answering yes	1		
There is a large need	1				
Transports to another hospitals	1				
Likes when the going gets tough	1				

“If you priorities the need for maintaining free air-ways you need a nurse anaesthetist. You cannot solve airway problems by a few visits to the surgical theatre”.

“The profile of the emergency car may change, but its role as highly specialized spearhead and research bench will remain”.

Fifty-two departments (93%) suggested that there was an interest among their nurse anaesthetists to participate in the future pre-hospital medical care. “The emergency car activities are attractive to nurse anaesthetists. They grow in their professional role and develop further. Four departments (7%) opposed to this. Table 2 identifies the categories found in the comments to this answer.

The future role of the nurse anaesthetists as described by the answering 56 departments is displayed in table 3.

An example on how the departments look at the future role of the nurse anaesthetists:

“Spearhead competence is always needed to strengthen the ambulance medical care, preferably in combination with an emergency car to be able to re-prioritise and become flexible. Increasingly advanced medical supplies are brought to the patient and more hands will be needed. It will still be needed two persons with the patient to be able to give adequate care during the transport to the hospital. You never give medical care alone to a patient in critical condition anywhere else in the medical world. The spearhead competence of a nurse anaesthetist will be needed in the helicopter and in the emergency team in the future.”

### Discussion

The median year (1984) of commencing pre-hospital care is well correlated to what Svedberg (15) emphasized, i.e. that all countries in Scandinavia, except Sweden, had ambulances staffed with nurses and/or physicians, and that involvement of these professionals was necessary for the improvement of the services. In 1979, the Medical Association emphasized the ambulances service should be a qualified form of emergency care directed by physicians, preferably anaesthetists (14).

Table 3. Comments from the departments about the future role of the nurse anaesthetists in pre-hospital care.

Categories "Positive" (n=16)	Frequency (n=58)	Categories "Don't know" (n=4)	Frequency (n=12)	Categories "Negative" (n=2)	Frequency (n=2)
Rotation pre-hospital/hospital	10	Didn't understand question	5	Together with anaesthesiologist	1
Work in Emergency team	10	No major change	4	Need of anaesthetists is decreasing	1
Emergency Car operations	6	Don't know	2		
Complement to paramedics	6	Depends on pre-hospital education	1		
Spearhead competence in ABC	6				
Transports and need of intubation readiness	5				
Helicopter with anaesthesiologist	3				
Knowledge of anaesthesia is necessary in the future	2				
Special knowledge of seriously ill children	2				
Like to be more engaged in pre-hospital work	2				
Very important when ED:s are closed down	1				
Supervision and education	1				
Experience of self-governed work	1				
EMS wants help of nurse anaesthetists	1				
Pain treatment in domestic environment	1				

A prerequisite for a nurse anaesthetist to act is that there exists a "general directive" on pharmaceutical drug administration (11). Seventy-seven percent of the departments have valid general directives, but surprisingly 9% of the departments only allow pharmaceutical treatment after telephone consultation in each individual case. The nurse anaesthetists depending on this have very limited treatment possibilities, since severe acute conditions often require very fast decisions.

Lossius et al. (5) demonstrated that a helicopter or an emergency car manned with an anaesthetist have a major clinical impact on critical ill and injured patients. The number of patients who have gained years to live was relatively low, 9% of the population, but the total number of gained years to live was high (640 years). This was an effect of the advanced medical treatment given by the anaesthetist.

Emergency cars manned with nurse anaesthetists have been active for more than 20 years in Sweden. During this period, it has never been demonstrated, scientifically or objective that cars manned with other competences - including physicians - could extend the medical care further to the critical ill patient. However, a car manned with a physician will be significantly more expensive to run, due to differences in salaries between nurses and physicians.

The ability to maintain free airways by endotracheal intubation was the most noted step that a nurse anaesthetist could add to pre-hospital medical care as opposed to what other specialized nurses (ICU, Ambulance) could add. Despite the fact that there exists a special ambulance nursing care training, 91% of the departments considered that their nurse anaesthetists would participate in the pre-hospital care within five years. This can depend on that pre-hospital care is very attractive to nurse anaesthetists. Ninety-three percent of the departments

answered "yes" on the question if such an appointment was needed.

### Conclusion

This study clearly demonstrates that the participation of the nurse anaesthetist in the pre-hospital medical care is widespread (77% of departments), despite that other nurses (39% of the pre-hospital medical staff the year 2002) had a marked increase in participation during the last few years (12). It is worth mentioning that there is no statistical significant figure supporting the idea that the nurse anaesthetist's role has changed during the past five years. The study also clearly demonstrate that the departments of anaesthesiology in Sweden believe that the nurse anaesthetists will have an important complementary function in the future pre-hospital medical care environment.

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### References

1. Aitkenhead AR, Smith GS 2001 Textbook of anaesthesia. London: Churchill Livingstone · Forthcoming Title.
2. Ek B, Zetterström H 2000 Ambulanshelikopter i Jämtland. Läkartidningen 2000; 97: 1416-1418, 1421-1422.
3. Ekström G 1986 Från larmklocka till blåljus. Hudiksvall: Winbergs Förlag AB.
4. Jonasson P 1998 Akutbilssjuksköterskans roll i prehospital akutsjukvård kompetens, ansvar och kvalitetsutveckling. Hälsohögskolan Väst, Skövde.
5. Lossius H M, Søreide E, Steen P A 2000 Clinical Impact of an anaesthesiologist-manned ambulance service in critically ill and

- injured patients. AIRMED 2000.
6. Murray JA, Demetriades D, Berne TV, et al 2000 Prehospital intubation in patients with severe head injury. *J Trauma* 2000; 49: 1065-1070
  7. Polit D, Hungler B 1999 *Nursing Research. Principles and Methods*. Philadelphia: Lippincott Company.
  8. SoS, Socialstyrelsen (The Swedish National Board of Health and Welfare) 1990 Ambulanssjukvården inför år 2000. Rapport 1990:10. Stockholm, Sweden.
  9. SoS, Socialstyrelsen (The Swedish National Board of Health and Welfare) SOSFS 1995:8. Ansvar, kvalitetssäkring och läkemedelsförsörjning inom ambulanssjukvården m. m, Stockholm: Sweden.
  10. SoS, Socialstyrelsen (The Swedish National Board of Health and Welfare) SOSFS 1999:17. Socialstyrelsens föreskrifter om läkemedelshantering inom ambulanssjukvården. Stockholm, Sweden.
  11. SoS, Socialstyrelsen (The Swedish National Board of Health and Welfare) SOSFS 2000:1. Socialstyrelsens föreskrifter och allmänna råd om läkemedelshantering i hälso- och sjukvården. Stockholm, Sweden.
  12. SoS, Socialstyrelsen (The Swedish National Board of Health and Welfare) 2002 Meddelandeblad 2003. Svensk ambulanssjukvård 2002. Artikelnr: 2003-126-13. Stockholm, Sweden.
  13. SPKs rapportserie 1991:17 1991 Svensk ambulanstjänst. Konkurrentsförutsättningar. Stockholm: Statens pris- och konkurrensverk.
  14. SPRI-rapport nr 27 1980 Ambulanssjukvård. Stockholm SPRI.
  15. Svedberg S. Ambulanssjukvården måste få medicinsk ledning. *Läkartidningen* 1975; 72, 3192-3193.
  16. Svensson A, Wallman-C:son C-A, Jerntorp P 1993 Akutbil - utvärdering av försöksverksamhet i Malmö. Malmö: Sjukvården Malmö, AkutCentrum.
  17. Whipple JK, Lewis KS, Quebbeman EJ, et al. 1995 Analysis of pain management in critically ill patients. *Pharmacotherapy* 1995; 15: 592-599.
  18. White LJ, Cooper JD, Chambers RM, et al. 2000 Prehospital use of analgesia for suspected extremity fractures. *Prehosp Emerg Care* 2000;4 :205-208
  19. Winchell RJ, Hoyt DB 1997 Endotracheal intubation in the field improves survival in patients with severe head injury. *Arch Surg* 1997; 132:592-597.
  20. Suserud BO 1998 The role of the nurse in pre-hospital emergency care. The Department of Anaesthesiology And Intensive Care. Sahlgrenska University Hospital. Göteborg, Sweden.