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A Huge Increase in Ambulatory Surgery Practice in Portugal

P. Lemos

Abstract

The Portuguese Association of Ambulatory Surgery (APCA) publishes the data from its fifth national survey on ambulatory surgery regarding surgical activity performed in 2009. Sixty hospitals were involved representing all national surgical public hospitals, including the Autonomous Regions of Madeira and the Azores. A total of 583,278 operations were performed, representing an increase of 22.5% in comparison to our last survey in 2005. All hospitals have already a day surgery programme running, which allows a national rate of 43.7% of non-emergency surgery performed on a day surgery basis (179,646 major operations in a total of 411,173 non-emergency operations performed), doubling the 22% obtained in 2005. There are 22 hospitals (36.7%) with percentages higher than 50% of day surgery in comparison with only 2 hospitals registered in 2005. Ambulatory surgery (AS)

nationally is homogeneously developed in all regions of the mainland: North (46.7%), Middle (41.5%), Lisbon and Tejo Valley (42.4%), Alentejo (50.1%) and Algarve (64.0%). The Autonomous Region of Madeira and the Azores, although with results below the ones obtained in the mainland, have a positive evolution with 26.7% and 17.4%, respectively. The Final Report of the National Committee for the Development of Ambulatory Surgery in Portugal (CNADCA) published in October, 2008, and the subsequent approval of its proposals by the Health Ministry were critical for the results obtained, foreseeing a national result of over 50% of procedures on a day surgery basis during 2010, allowing Portugal to be amongst the same performance of the majority of the industrialised countries in this field.

Keywords: Ambulatory surgery; Portuguese data; Trends in day surgery.

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Introduction

Activity on a day surgery basis began in Portugal in the mid 90's. The evolution of this practice has been slow due to the poor support of the Portuguese government for this surgical regimen. By 2005, just 22.0% of all non-emergency surgical activity was performed on a day surgery basis [1]. In 2007, with the nomination of a National Committee for the Development of Ambulatory Surgery (CNADCA) and the publishing of several proposals towards an effective nationwide expansion approved by the Health Ministry [2], Portugal seemed to face a new era in this surgical field. With the purpose of evaluating the impact of these governmental incentives, the Portuguese Association of Ambulatory Surgery (APCA) started a new national survey and these results are presented in this paper.

Methods and Material

The fifth national survey on ambulatory surgery (AS) undertaken by APCA in partnership with CNADCA and the Health Secretary of State, was sent in March 2010 to the electronic address of the Head of Management of all public hospitals. The survey requested data of the surgical activity performed in 2009, and information related to the organisation and clinical indicators of the day surgery programmes.

Results

Sixty public hospitals were included in the present survey which represent the total hospitals with surgical activity in Portugal, including the Autonomous Regions of the Azores and Madeira. The total results from the surgical activity are presented in Table 1. There was a general increase in the performance of surgical activity,

Table 1 Total surgical activity in the 60 public hospitals during 2009 & 2005.

Surgical Activity	Surgical Regimen	No. Surgeries		Difference
		2009	2005	
Normal surgical activity		517,588	450,174	15.0%
- Non-emergency surgery	Inpatient Surgery	(231,527)	(268,721)	- 13.8%
	Ambulatory Surgery	(179,646)	(75,935)	136.6%
- Emergency surgery		(106,415)	(105,518)	0.9%
SIGIC – Additional production		65,690	26,064	152.0%
TOTAL		583,278	476,238	22.5%

Table II Surgical procedures performed on a day basis in 2009 and evolution of day surgery practice in the last 8 years by Health Region (excluded SIGIC – additional production).

Health Regions	Number of Hospitals	Surgical Patients Performed on a Day Basis				
		2009		2005	2003	2001
		Number	% ¹	% ¹	% ¹	% ¹
North ARS	16	66,293	46.7	23.3	13.6	8.6
Centre ARS	17	32,369	41.5	20.6	17.4	7.8
Lisbon & Tejo Valley ARS	17	64,206	42.4	24.1	14.7	5.6
Alentejo ARS	4	7,706	50.1	20.0	17.5	1.8
Algarve ARS	2	6,122	64.0	17.0	16.9	13.7
Autonomic Region of Madeira	1	1,519	26.7	21.0	0.0	0.2
Autonomic Region of Azores	3	1,431	17.4	0.0	0.0	0.0
TOTAL	60	179,646	43.7	22.0	14.7	7.1

¹percentage based on the total of non-emergency surgery.

especially in patients operated on a day surgery basis. Non-emergency inpatient surgery was the only sector that has been reduced from 2005 to 2009. The growth of ambulatory surgery in the country has increased steadily since 2001 in the different health regions of Portugal (Table II). Although with a fewer number of hospitals, Algarve and Alentejo (with just 2 and 4 hospitals, respectively) in the south of the country are the health regions where ambulatory surgery has the highest day surgery rates. Figure 1 shows the homogeneous development of ambulatory surgery throughout the whole country. In terms of absolute figures the North is the most representative health region with more than one third of the total national day surgery performed in its hospitals and with the lowest variance of performance amongst the hospitals (Graph 1). The basket of the most frequent surgical procedures performed on an ambulatory surgery basis showed an impressive increase too, doubling the rate from 30% (2005) to 60% (2009) of all non-emergency procedures (Table III). Of note is the increase in cataract surgery that is now performed on a day surgery basis in more than 90% of cases. Three in each four carpal tunnel operations are performed in a day surgery setting representing the second most frequent procedure after cataract surgery. The next most frequent procedures are inguinal hernia repair and varicose vein surgery, both representing just about 40% on a day surgery basis, almost three times more than in 2005. But the development in day surgery in Portugal is also reflected by an increase in more complex surgery (Table IV). Of note is the increase in the following three

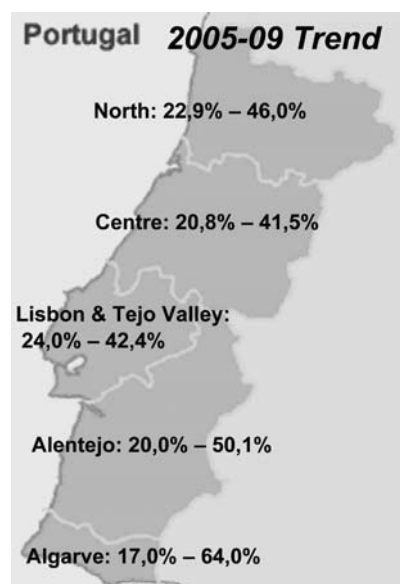
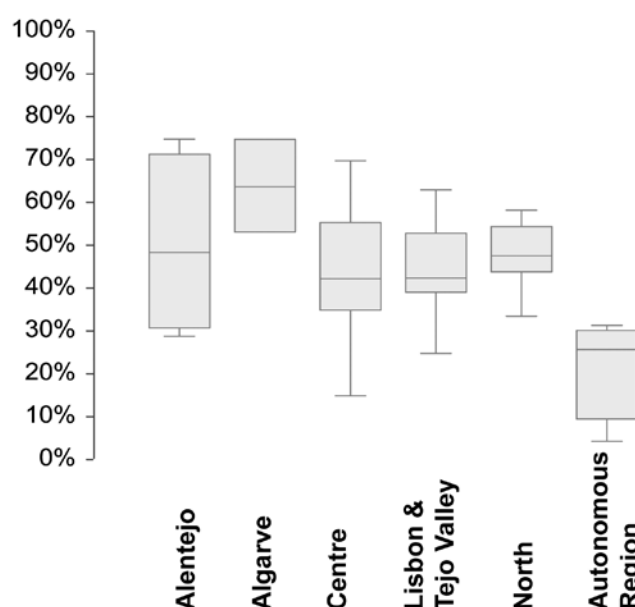


Figure I Trend in Ambulatory Surgery rates between 2005 and 2009 in all Public Surgical Hospitals, by Health Region (excluded SIGIC – additional production).

Graph I Percentage of ambulatory surgery by Health Region in 2009.



Health Regions	1st Quartil	Median	3rd Quartil	Variance
Alentejo	34.5%	48.6%	64.3%	4.5%
Algarve	58.5%	63.9%	69.3%	2.3%
Centre	35.1%	42.5%	54.4%	4.0%
Lisbon & Tejo Valley	39.5%	42.6%	52.4%	1.8%
North	43.8%	47.8%	53.7%	0.5%
Autonomous Regions	20.0%	25.9%	27.8%	1.4%
Total	36.5%	43.8%	53.6%	2.6%

procedures: abdominoplasty (16.2%), laparoscopic cholecystectomy (15.8%) and thyroid lobectomy (15.7%).

The promotion of ambulatory surgery in Portugal was associated with the development of basic (Table V) and desirable criteria (Table VI) in the organisation of AS programmes. These criteria were considered critical to carry out quality in the AS healthcare services and were officially published by the Portuguese Government [3].

Table III Evolution of the most frequent procedures (Group A) performed on a day surgery basis between 2005 & 2009.

Group A Surgical Procedures	2009			2005			% Difference Amb/ Total (2009-2005)
	Ambulatory	Total	%Amb / Total	Ambulatory	Total	%Amb / Total	
Knee arthroscopy	731	4,004	18.3	167	3,807	4.4	13.9
Arthroscopic meniscus	545	2,899	18.8	73	2,083	3.6	15.2
Surgical removal of tooth	1,202	1,775	67.7	635	2,019	49.6	18.1
Cataract	64,104	70,374	91.1	16,494	30,171	53.9	37.2
Inguinal hernia repair	6,694	17,541	38.2	3,020	16,518	18.0	20.2
Dilatation and curettage of uterus	2,917	8,654	33.7	2,478	11,332	21.9	11.8
Varicose veins	5,691	14,082	40.4	1,121	9,426	11.9	28.5
Tonsillectomy	3,198	9,491	33.7	946	6,342	14.9	18.8
Adenoidectomy without tonsillectomy	2,088	4,023	51.9	1,034	3,813	27.1	24.8
Myringotomy with tube insertion	2,807	5,202	54.0	1,039	3,631	28.6	25.4
Endoscopic female sterilisation	1,087	2,539	42.8	768	2,660	28.9	13.9
Squint	946	1,760	53.8	838	1,643	51.0	2.8
Rhinoplasty	593	4,430	13.4	169	2,639	6.4	7.0
Local excision of breast	1,672	4,196	39.8	1,204	3,654	33.1	6.7
Haemorrhoidectomy	1,143	3,019	37.9	401	2,279	17.6	20.3
Pilonidal cyst	2,550	4,283	59.5	1,496	3,938	38.0	21.5
Circumcision	4,012	5,304	75.6	1,795	3,984	45.1	30.5
Dupuytren's contracture	736	1,720	42.8	133	555	24.0	18.8
Carpal tunnel release	9,292	12,115	76.7	4,754	9,508	50.0	26.7
Orchidectomy + -pexy	1,141	2,149	53.1	102	1,905	31.8	21.3
Male sterilisation	153	207	73.9	90	247	41.3	32.6
Repair of deform. on foot	688	3,064	22.5	389	2,317	3.9	18.6
Removal of bone implants	1,307	4,767	27.4	389	4,495	8.7	18.7
Baker's cyst	(1,091)	(1,722)	63.4				
Legal abortion	(2,083)	(3,254)	64.0				
Sphincteroplasty / Anal fistulectomy	(649)	(972)	66.8				
Urinary female incontinence	(316)	(3,093)	10.2				
Hysteroscopy	(4,630)	(5,688)	81.4				
TOTAL¹	117,391	193,458	60.7	40,561	133,568	30.4	30.3

¹ excluded the 5 last procedures for allow proper comparison between 2005 and 2009.

Table IV Evolution of the less frequent procedures (Group B) performed on a day surgery basis between 2005 & 2009.

Group B Surgical Procedures	2009			2005			% Difference Amb/ Total (2009-2005)
	Ambulatory	Total	%Amb / Total	Ambulatory	Total	%Amb / Total	
Thyroid lobectomy	243	1,549	15.7	99	1,764	5.6	10.1
Laparoscopic cholecystectomy	1,739	11,030	15.8	738	8,190	9.0	6.8
Laparoscopic antireflux	12	241	5.0	28	352	8.0	- 3.0
TURP	221	1,581	14.0	156	1,647	9.5	4.5
Hysterectomy (LAVH)	8	440	1.8	0	257	0.0	1.8
Repair of cysto- and rectocele	278	2,259	12.3	57	2,148	2.7	9.6
Lumbar microdiscectomy	149	2,092	7.1	98	2,475	4.0	3.1
Cruciate ligament repair	42	601	7.0	19	440	4.3	2.7
Bilateral breast reduction	44	560	7.9	45	499	9.0	- 1.1
Mastectomy	112	1,421	7.9	78	2,445	3.2	4.7
Abdominoplasty	174	1,076	16.2	114	710	16.1	0.1
TOTAL	3,022	22,850	13.2	1,432	20,927	6.8	6.4

The percentage of the hospitals that confirm both basic and desirable criteria can be seen in Graph 3 and Graph 4 respectively. Hospitals from different health regions, with exception of the Autonomous Regions (Madeira and the Azores), seem to accomplish the majority of criteria. In the North this finding is more consistent with a low variance amongst hospitals.

Discussion

AS has had a huge increase in the last few years in Portugal due to the multiple initiatives developed by a National Committee (CNADCA) and the Portuguese Association for Ambulatory Surgery (APCA) in the promotion of this surgical regimen that were confirmed by the policies established by the Health Ministry. The results were surprising. The national rate doubled in only four years, from 22.0% in 2005 to 43.7% in 2009. The rate is close to the magic barrier of 50% of all non-emergency surgery, a target defined by CNADCA in its final report [4].

The increase of AS practice is the result not only of an important number of new cases but also the transfer of patients from the inpatient to the AS setting. This surgical regimen not only allowed in Portugal additional surgical production but also a reduction in the inpatient setting, with a consequent reduction in the surgical waiting list. It is interesting to note that this phenomenon happened all over the country in a homogeneous way. It seems from the results that Portugal has reached a consolidation of its ambulatory surgery practice, attracting all partners for their involvement, even the more resistant ones.

It is important to notice that:

- i) Ophthalmology, namely cataract surgery became a paradigm of

AS programmes, representing now more than 90% of all non-emergency surgery;

- ii) 22 hospitals (36.7%) have AS practice with rates over 50%, in comparison with just 2 hospitals in 2005;
- iii) all hospitals in the mainland have surgical activity on a day surgery basis (in 2005, 7 hospitals had no AS activity at all) and only 4 hospitals have rates below 30% of its non-emergency surgery;
- iv) surgery with higher complexity is being more and more included in AS programmes, reflecting the increase in diversity of day surgery activity in Portugal.

This last indicator is an important factor reflecting an increase of interest, motivation and satisfaction among the multi-professional teams involved in AS programmes.

Nevertheless, there are negative facts that must be pointed out. In some hospitals the AS concept has profound organisational deficits where the time for discharge is the only substantial difference between the inpatient and the outpatient settings. The innovative character of AS depends on its organisational model being patient centred and based on a separate flow from inpatients allowing an increased throughput of patients in a more efficient, effective and safe surgical environment. Bearing this in mind the Portuguese health policymakers publish basic and desirable organisational criteria in order to promote an increase in quality of AS programmes [3]. The majority of public hospitals made a great effort aimed at their implementation when compared to data from 2006 [4]. In fact, the majority of basic organisational criteria exist in more than 80% of public hospitals. The exception is the monitoring of clinical indicators and the availability of a phone contact from one member of the team where we found lower percentages. The former, that includes cancellation of booked procedures and unplanned overnight admissions, are critical for the evaluation of efficiency and safety in AS programmes, respectively [5]. The latter, is fundamental taking

Table V Basic criteria in the organisation of ambulatory surgery programmes.

A. Basic criteria	Description
A1. Patient flow	Sequence: admission > preparation room > operating room > post-anaesthetic care unit (PACU) > second stage recovery room > home discharge (with the exception of the operating room and the PACU that might be shared in integrated facilities, all area should be independent from the inpatient circuit)
A2. DS in the Hospital Organisation	Recommendation for the inclusion in the hospital organigram of a ambulatory surgery programme with an official nomination of a co-ordinator / Director, and schedule of an exclusive operating surgical time for this programme
A3. Patient Selection and Discharge Criteria	Establishment of clinical guidelines for patient selection and discharge criteria in the ambulatory surgery programme
A4. Clinical Information	Oral and written information with instructions for the post-operative period should be given to each patient and relatives at the home discharge.
A5. Production and clinical indicators	Namely cancellation of booked procedures (failure to attend and cancellation after arrival) and unplanned overnight admission
A6. Post-operative support: phone contact	An emergency phone contact for a member of the team should be given to each patient operated on in a day surgery programme
A7. Post-operative support: phone call in the 24 h after surgery	A phone call should be made in the 24 hours after surgery

into consideration the actual legis artis for AS [6]. Regarding the desirable organisational criteria it is difficult to accept that only 25.0% of the hospitals involved in this survey have a separate flow from inpatients or have no independent facilities for those patients who have to overnight in the hospital. This means that many of the advantages associated with AS programmes, namely the reduced risk of hospital acquired infections are lost [7]. Other criteria, like additional clinical indicators or patient satisfaction are seldom used in those AS programmes, explaining why there is a long way to go in the qualitative improvement of AS practice in the Portuguese public hospitals.

Conclusion

The present survey clearly shows a huge increase in AS practice in Portugal in the past few years. However, the author believes that there is still progress to be made, not only in surgical production where it is feasible to reach higher rates in the near future, but also in the quality improvement of the organisation of our AS programmes.

With the recent creation by the Portuguese Government of a promotional package for the development of AS in the country, Portugal anticipates having higher rates in this surgical regimen and thus having further benefits from the clinical, economic and social advantages that AS offers. Portugal will be offering more and better healthcare for its citizens.

Acknowledgement

The author thanks the co-operation of the Head of Management of the public Portuguese hospitals in filling in the proposed questionnaire that allowed the present survey.

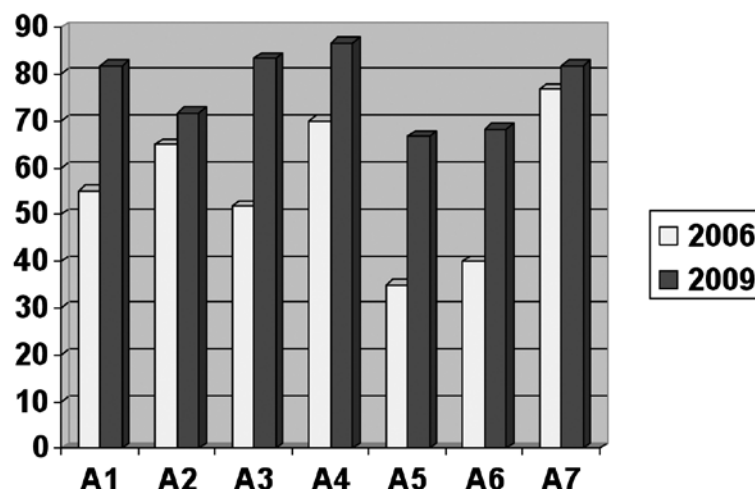
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Table VI Basic criteria in the organisation of ambulatory surgery programmes.

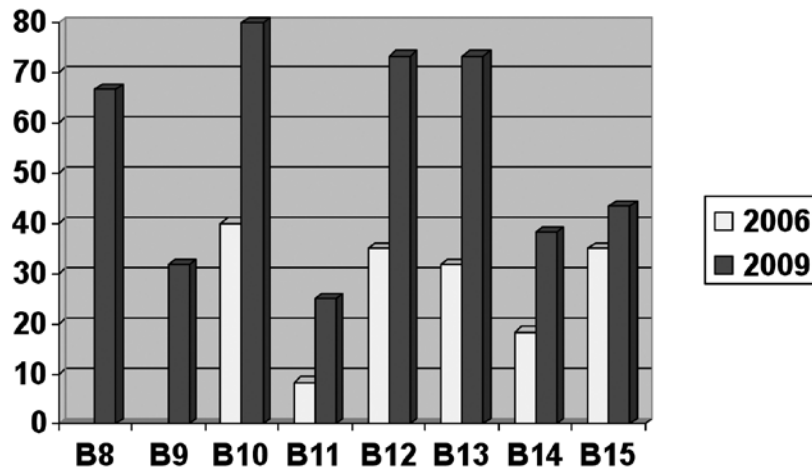
B. Desirable criteria	Description
B8. Increase in the AS rate	Increase in the AS rate (based on the total of the non-emergency surgery) in a mean value of 15% per year, during 3 years
B9. Reduction in the number of the surgical beds	Reduction in 5–10%, per year, during three years in the number of the surgical beds
B10. Patient flow in every situation of the hospital	As described in the criteria A1
B11. Logistic for patients and relatives	Exclusive spaces for patients and relatives of the AS programme, especially waiting room before surgery and independent wards for patients who are included in programmes with overnight stay
B12. Human resources	Nurse, administrative and auxiliary staff should be exclusive to the AS programme
B13. Clinical Guidelines	Development of clinical guidelines especially in the pre-operative screening tests and for post-operative pain control and nausea and vomiting prophylaxis
B14. Continuous monitoring of clinical indicators	Continuous monitoring of clinical indicators such as unplanned return to the operating room in the same day of surgery or unplanned return or readmission to the DSU or hospital within 30 days after surgery
B15. Patient satisfaction	Evaluation of patient and relatives satisfaction, through anonymous questionnaires

Graph 2 Percentage of hospitals that confirm the Basic Criteria and evolution between 2006 and 2009.



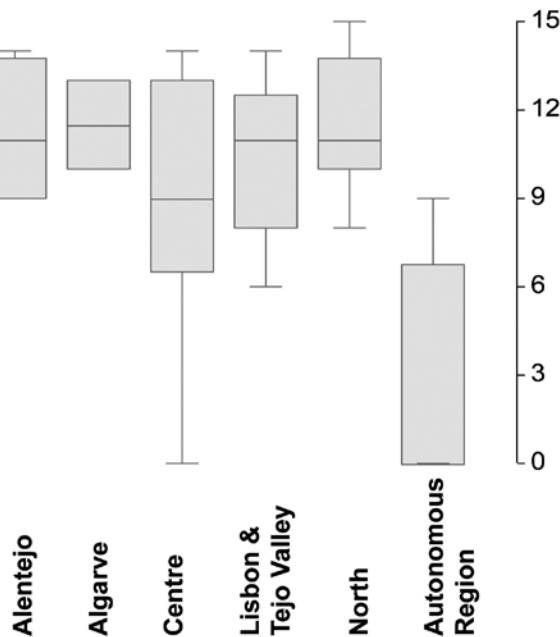
	A1	A2	A3	A4	A5	A6	A7
2006	55,0%	65,0%	51,7%	70,0%	35,0%	40,0%	76,7%
2009	81,7%	71,7%	83,3%	86,7%	66,7%	68,3%	81,7%

Graph 3 Percentage of hospitals that confirm the Desirable Criteria and evolution between 2006 and 2009.



	B8	B9	B10	B11	B12	B13	B14	B15
2006	n.i.	n.i.	40,0%	8,3%	35,0%	31,7%	18,3%	35,0%
2009	66,7%	31,7%	80,0%	25,0%	73,3%	73,3%	38,3%	43,3%

Graph 4 Accomplishment of Basic & Desirable Criteria, by Health Region in 2009.



Health Regions	1st Quartil	Median	3rd Quartil	Variance
Alentejo	9.0	11.0	13.3	6.92
Algarve	10.8	11.5	12.3	4.50
Centre	7.0	9.0	13.0	14.78
Lisbon & Tejo Valley	9.0	11.0	12.0	16.47
North	10.0	11.0	13.3	4.40
Autonomous Regions	0.0	0.0	2.3	20.25
Total	8.0	11.0	13.0	16.10

Using mobile healthcare facilities for day surgery

Vanguard Healthcare Solutions

In an age that has become increasingly defined by the need for smart use of budgets, healthcare organisations have been striving to find innovative and effective ways in which to treat their patients. In its simplest form, the challenge is to deploy services quickly and efficiently, without sacrificing compliance, standards and patient experience – in other words, to offer high-standard health services without the need for significant capital expenditure.



Mobile healthcare facilities have been instrumental in achieving this flexibility for many healthcare organisations, none more so than for Gloucestershire Hospitals NHS Foundation Trust – the public health organisation for Gloucestershire, UK. Over the past four years, mobile units have allowed Gloucestershire Trust to respond to an array of challenges and situations and provided a flexible, cost-effective day surgery service to support and supplement the Trust's own hospitals.

What is a mobile surgical unit?

Mobile healthcare facilities are designed to provide healthcare organisations with a suitable clinical environment in which to carry out surgical procedures, but in a temporary and fully mobile facility. Previously unheard of in much of continental Europe, mobile surgical units have now been made widely available across the EU through a new international service launched by Vanguard Healthcare Solutions – a British company that designs and operates the world's largest fleet of mobile healthcare units. The mobile units designed and operated by Vanguard offer a completely self-contained surgical facility that can be deployed, if necessary, in many different locations in a short period of time.

They can be deployed for a variety of reasons, but predominantly mobile units are used in response to one of three situations: to boost capacity in order

to meet rising demand and generate income; to provide alternative facilities while a permanent unit is being refurbished; or to respond to an emergency by providing a quick boost to surgical capacity. In Gloucestershire, mobile units have helped the county's NHS Trust respond to each of these key scenarios and have become, as a result, a core element of service delivery across the region.

Responding to emergencies: Beating the floods of 2007

When torrential flooding ground the county to a halt in the summer of 2007, hundreds of patients' day surgery procedures had to be cancelled, with the hospital in the town of Tewkesbury virtually inaccessible and power, water and roads all seriously disrupted.

With 8,000 outpatient procedures and 1,200 inpatient operations facing cancellation, the Trust worked with Vanguard Healthcare to deploy a mobile day surgery centre in the grounds of a private hospital in the nearby town of Cheltenham. Working in partnership with Vanguard's nurses and operating department practitioners, the Trust's clinical teams were able to use the mobile unit to treat 700 non-urgent day surgery patients.

Yvonne Pirso, Associate Director of Communications from Gloucestershire Hospitals NHS Foundation

Trust, said: “We were desperately in need of extra capacity so it was with huge relief that we were able to call on Vanguard’s mobile day surgery unit.

“Positive feedback from the patients treated was widespread and praiseworthy,” added Yvonne. “Many commented on how bright, clean and efficient the facilities were, while our own clinical teams were impressed by how well equipped it was.”

Protecting capacity at Gloucestershire’s hospitals

When Stroud General Hospital underwent a £1.8m refurbishment of its operating theatres and endoscopy units in 2008, it initially seemed that patients would need to be diverted to Gloucestershire Hospitals NHS Foundation Trusts’ main hospitals in either Cheltenham or Gloucester. Wishing to ensure that treatment could still be delivered locally, the Trust turned again to Vanguard to ensure that patients could still be treated as close to their homes as possible.

The sheer incline of the approach to Stroud General Hospital meant that the hospital grounds themselves were not a viable location, so Vanguard secured an alternative site in the spacious car park of Focus DIY – a superstore close to the Stroud town centre. With the unit deployed in an even more convenient location for patients in the area, the Trust was able to maintain its surgical capacity while the refurbishment was completed but avoided the disruptive, costly and time-consuming transfer of patients to hospitals in Cheltenham or Gloucester.

When the Stroud refurbishment was completed in the following year, the Trust wanted to boost the capacity of the day surgery services at its flagship hospital – Gloucestershire Royal Hospital in Gloucester – using

a temporary solution. Once again, a Vanguard unit provided the means by which the Trust could bolster the capacity at the hospital and treat far more patients that would otherwise have been possible.

Steve Peak, former Director of Service Delivery of Gloucestershire Hospitals NHS Foundation Trust, said: “This kind of partnership has proved invaluable for our patients. We had good reports from patients who have been very impressed with both the environment and the service provided in the mobile units.”

The benefits of flexible day surgery

The rapid and significant development of mobile surgical technologies has meant that healthcare providers are no longer limited to acute settings when it comes to day surgery procedures and, as with Gloucestershire Hospitals NHS Foundation Trust, healthcare organisations are able to use mobile facilities to implement a flexible framework for service delivery.

Vanguard’s CEO Ian Gillespie concluded: “Whatever the situation, organisations need to be prepared to meet the challenges of the modern era head on. Whether it is responding to an unexpected emergency, bolstering capacity while a refurbishment is carried out or simply meeting increased demand, services can be deployed where they are needed, and where they can provide maximum benefit to both Trust and patient.”



9th International Congress on Ambulatory Surgery

State of the Art and Future Possibilities

Copenhagen 8–11 May 2011

Congress Programme and Free Paper Sessions

Congress Programme

Sunday 8 May 2011

Workshops:

- Regional anesthesia and ultrasound
- Endoscopy for nurses
- Akupuncture

Congress Programme

Monday 9 May 2011

09.00 – 10.30	<p>Opening: Moderator: Claus Toftgaard (DK)</p> <ul style="list-style-type: none"> • Danish Minister of Health (DK) • President of IAAS, Paulo Lemos (P) • Nicoll Lecture: Paul F.White (US):“Clinical research in ambulatory surgery:What have we obtained and what is still remaining?” • Claus Toftgaard (DK): International Day Surgery Activity – The 2011 Survey
10.30 – 11.00	Coffee break
11.00 – 12.30	<p>The patient at Risk I Moderators:Anil Gupta (S) and Ian Jackson (UK)</p> <ul style="list-style-type: none"> • Ian Jackson (UK): Should Routine Thrombo-prophylaxis be used in Patients undergoing Day surgery? • Maria Janesco (H): Is there a risk of operating patients with Coronary stents as Day cases? • Sibylle Kozek, (A): Can Perioperative Bleeding and Coagulation problems be assessed by bedside tests?
11.00 – 12.30	<p>News in local/regional Anesthesia Moderators: Johan Raeder (N) and Sven Felsby (DK)</p> <ul style="list-style-type: none"> • Ulrich Spreng (N): Local infiltration anesthesia: Preventing pain at the origin • Axel Sauter (N): Ultrasound imaging for regional anesthesia: Better results and more fun? • Paul F.White (US): When it really hurts after ambulatory surgery (CH)
11.00 – 12.30	<p>Aspects of Inguinal Hernias in Day Surgery Moderators: Inge Glambek (N) and Dick deJong (NL)</p> <ul style="list-style-type: none"> • Inge Glambek (N): Open operations for inguinal hernias in day surgery. • J.W.A. Oosterhuis (NL): Open or Laparoscopic Inguinal Hernia Repair: a Surgeon's Preference? • Staffan Smeds (S): The problem with pain after surgery for inguinal hernia
11.00 – 12.30	Free papers I Moderators: Paulo Lemos (P) and Jan Eshuis (NL)
12.30 – 13.30	Lunch – Satellite symposia I
13.30 – 15.00	<p>The patient at Risk II Mod.: Sven Felsby (DK) and Jan Jakobsson (S)</p> <ul style="list-style-type: none"> • Jan Jakobsson (S): The patient without social network – is discharge to an empty house acceptable? • Douglas McWhinnie (UK): Should patient cooperation rather than physical status determine if the patient is fit for day surgery? • Jens Fromholt Larsen (DK): Do we need limits for obesity in day surgery?
13.30 – 15.00	Free papers II Moderators: Claus Toftgaard (DK) and Luc van Outryve (B)
13.30 – 15.00	<p>International projects in Day Surgery Moderators: Carlo Castoro (I) and Nigel Edwards (UK)</p> <ul style="list-style-type: none"> • Nigel Edwards (NHS Confederation UK): Surgery in the Hospital of the Future • Guy Dargent (EU Executive Agency for Health and Consumers): The Impact of EU Health Programme on Ambulatory Surgery • Carlo Castoro (IAAS, I): Results of IAAS-EU Projects • Gamal Mohamed (H): Ambulatory Surgery in Eastern EU Countries: Barriers and Opportunities • Naresh Row Tadepalli (India): Ambulatory Surgery in Developing Countries: Barriers and Opportunities
13.30 – 15.00	<p>Meet the experts Moderator: Beverly Philip (US)</p> <ul style="list-style-type: none"> • Kari Korttila (FIN): Case I • Jouni Ahonen (FIN): Case II
15.00 – 15.30	Afternoon tea
15.30 – 17.00	<p>Education in Day Surgery Moderators: Anne Birthe Bach (DK) and Wendy Adams (AU)</p> <ul style="list-style-type: none"> • Charlotte Ringsted (DK): To utilize the potential • Arne Haudal Refsum (N): A program for training • Wendy Adams (AU): Nurses' education in day surgery ... an Australian's experience
15.30 – 17.00	<p>Children in Day Surgery Moderators: Peter Ahlburg (DK) and Raafat Hannalah (US)</p> <ul style="list-style-type: none"> • Peter Larsson. (S): Premedication – why? • Michael Davidsen (DK): Limits of Day surgery in children • Birgitte Duch (DK): Pain treatment for children in ambulatory surgery • Thomas F. Bendtsen (DK): Peripheral nerve blockades in children
15.30 – 17.00	<p>Office based surgery Cost efficiency and convenience versus safety and quality, or...? Moderators: Johan Raeder (N) and Beverly Philip (US)</p> <ul style="list-style-type: none"> • Johan Raeder (N) : The Norwegian experience: Dental and ENT office based practice • Raj Dhumale (UK): Mixed surgery practice in the office • Jost Brökelmann (D): Comparison of Ambulatory Surgery and Doctor's office in Germany

15.30 – 17.00	<p>New technology for improving operating room efficiency Moderators: Tuula Kangas Saarela (FIN) and Doug McWhinnie (UK)</p> <ul style="list-style-type: none"> • Päivi Valta (FIN): Preoperative electronic evaluation • Marie-Louise Ulsøe (DK): Operating room management in Day Surgery • Kristiina Mattila (FIN): National benchmarking system for assessment of performance
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Tuesday 10 May 2011

09.00 – 10.30	<p>Plenary: The Nordic Model. Private contra public health Moderator: Jørgen Nordentoft (N)</p> <ul style="list-style-type: none"> • Introduction: Jørgen Nordentoft (N) • Kjeld Møller Petersen (DK): The Nordic Model • Beverly Philip (US): The US Model • Jörg Rüggeberg (D): The German Model • Discussion
10.30 – 11.00	Coffee break
11.00 – 12.30	<p>Nordic Session I Moderators: Dorrit Raaschou (DK) and Anita Døfler (DK)</p> <ul style="list-style-type: none"> • Katja Heikkinen (FIN): Empowering Patient education with internet in ambulatory orthopedic nursing • Pernille Hornsleth (DK): Non-anesthesiologist administered propofol sedation for Endoscopy • Ulrica Nilsson (S): Designed Music as a tool for patients in Day Surgery
11.00 – 12.30	<p>Frontline surgery in Day surgery Moderators: Peter Funch Jensen (DK) and Mohammad Gamal (H)</p> <ul style="list-style-type: none"> • Peter Funch Jensen (DK): Upper gastrointestinal • W. Wisselink (NL): Robot surgery in vascular surgery • Palle Osther (DK): Urology • Henrik Springborg (DK): Gynaecology
11.00 – 12.30	<p>Quality of care and accreditation Moderators: Jan Jakobsson (S) and Henrik Kehlet (DK)</p> <ul style="list-style-type: none"> • Ian Jackson (UK): Quality of care: what tools shall we use, how to compare outcome? • Beverly Philip (US): Accreditation as an indicator of quality: The US experience. • Henrik Kehlet (DK): What have we learned from the hernia register and how can these experiences be transferred?
11.00 – 12.30	<p>Patients with special problems Moderators: Anil Gupta (S) and Maria Janesco (H)</p> <ul style="list-style-type: none"> • Anna Lipp (UK): Diabetes mellitus: Tight control of blood sugar – risk or benefit? • Metha Brattwal (S): Smokers and Snufflers. To stop or not – does it change outcome? • Jan Eshuis (NL): Obesity. Co-morbidity and not size is the issue?
12.30 – 13.30	Lunch – Satellite Symposia II
13.30 – 15.00	<p>Nordic session II. State of the art in anesthesia and surgery in Ambulatory surgery Moderators: Jørgen Nordentoft (N) and Inge Glambek (N)</p> <ul style="list-style-type: none"> • Johan Raeder (N): Anesthesia methods: Quality and efficacy • Henrik Kehlet (DK): Surgical methods: Quality and efficacy. • Berit Karin Helland (N): Organization of Day care Surgery
13.30 – 15.00	<p>New trends in Anesthesia: Drugs, devices and daily routines Moderators: Sven Felsby (DK) and Paul Vercausse (B)</p> <ul style="list-style-type: none"> • Hans de Boer (NL): Will sugammadex change the use of muscle relaxation in ambulatory surgery? • Hugo Vereecke (NL): Target controlled infusion of propofol and remifentanyl – is it worth the trouble? • Sven Felsby (DK): Can we skip preoperative testing before day surgery?
13.30 – 15.00	<p>Samba meeting: Current Controversies in Ambulatory Anesthesia Moderators: Beverly Philip (US) and Kathy McGoldrick (US)</p> <ul style="list-style-type: none"> • Raafat Hannallah (US): What should we tell parents about the safety of anesthesia in infants and young children? • Lucinda Everett (US): How can clinical registries improve safety in ambulatory anesthesia? • Thomas Cutter (US): Regional anesthesia in ambulatory surgery: The disadvantages

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13.30 – 15.00	State of the art of Orthopedic day surgery Moderators: Jon Karlsson (S) and Jacky Reydelet (D) <ul style="list-style-type: none"> • Foot and ankle (S): Jon Karlsson • Knee :Jon Karlsson (S) • Shoulder: Jesper Blomquist (N) • Hand surgery: Anders Ditlev Jensen (DK)
15.00 – 15.30	Afternoon tea
15.30 – 17.00	Nordic session III Moderators: Metha Brattwall (S) and Anil Gupta (S) <ul style="list-style-type: none"> • Anil Gupta (S): ASA and day surgery: Routines and consensus • Jan Jakobsson (S): Pain treatment: The combined responsibility by nurses and anesthesiologists • Jon Karlsson (S): Arthroscopy procedures in day surgery: Developments and future • Metha Brattwall (S): Follow up and outcome for up to 6 months after day surgery
15.30 – 17.00	Free papers III Moderators: Carlo Castoro (I) and Robert Williams (US)
15.30 – 17.00	State of the art in vascular, plastic and ENT day surgery Moderators: Kristiina Mattila (FIN) and Hugh Bartholomew (AU) <ul style="list-style-type: none"> • Hugh Bartholomew (AU): Plastic surgery as Day Surgery • Petri Mattila (FIN): ENT as Day surgery – news and borders • Jørn Jepsen (DK): Trends in vascular surgery
15.30 – 17.00	Perioperative pain relief Moderators: Torben Mogensen (DK) and Jørgen Nordentoft (N) <ul style="list-style-type: none"> • Jørgen B. Dahl (DK): Postoperative pain treatment in ambulatory surgery • Narinder Rawal (S): Regional anesthesia • Paul White (US): Nausea as result of pain

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09.00 – 10.00	Patient safety Moderators: Torben Mogensen (DK) and Luc van Outryve (B) <ul style="list-style-type: none"> • Beth Lilja (DK): Are checklist of any use – how to improve safety? • Svend Schulze (DK) Safe surgery
09.00 – 10.00	Hygiene and infection Moderators: Anita Døfler (DK) and Hanne Føns (DK) <ul style="list-style-type: none"> • Jacky Reydelet (D): A business case for a freestanding unit for sterilization • Helle Amtsbiller (DK): Evidence for the sterile routines in the OR – with special focus on the staff, the patients, and visitors • Hans Jørn Kolmos (DK): Hygiene in the Operating Room
09.00 – 10.00	Satellite Symposia: IT solutions for the future <ul style="list-style-type: none"> • Torben Christensen (DK): Management of the OR • TBD: Management of the Emergency Room
10.00 – 10.30	Coffee Break
10.30 – 12.00	Plenary: Special problems of care Moderator: Johan Raeder (N) <ul style="list-style-type: none"> • Olav Sivertsen (N): How far can the patient travel for ambulatory surgery? • Peter Ahlburg (DK) and Ian Smith (UK): Extremes of care – neonates and 80+ • Johan Raeder (N): Social security and compliance • Doug McWhinnie (UK): Special solutions using mobile units for places without any OR.
12.00 – 13.00	Plenary: Outcome/Quality Moderators: Sven Felsby (DK) and Paulo Lemos (P) <ul style="list-style-type: none"> • Birgitte Majholm (DK): Does improving quality improve outcome? • Mads Koch Hansen (DK): Which strategy to improve quality in Day Surgery? • Paulo Lemos (P): What should we measure in Day Surgery programs?
13.00 – 13.30	Farewell and Welcome to Budapest 2013 Claus Toftgaard (DK) and Mohammed Gamal (H)
14.00 – 16.00	General Assemblies for the Nordic Associations

Free Paper Sessions

Monday 9 May 2011			
1100 – 1230	FP01	Free Paper I Moderators: Paulo Lemos (PT) + Jan Eshuis (NL)	Session room 15
1100 – 1110	FP01.01	Audit of day care anaesthesia at our centre over the last ten years MM Begani (IN), S Shah, Dhriraj	
1110 – 1120	FP01.02	Sugammadex usefulness in the ambulatory setting (ENT) Maria I Garcia-Vega (ES), B San Antonio, E Lucena, Md Carmen Martinez M Sanchez	
1120 – 1230	FP01.03	Arthroscopic lateral retinaculum release (ALRR), a new optional technique as a day surgery activity Zsolt Knoll (HU)	
1130 – 1140	FP01.04	Ambulatory laparoscopic cholecystectomy – dream or reality? Lajos Barna Tóth (HU)	
1140 – 1150	FP01.05	How to establish and run a block room (BR) P Toft, Igor Filipovski (DK), M Broch	
1150 – 1200	FP01.06	Safe intubation and anesthesia with rapid emergence by using TCI-Propofol –Remifentanil and Desflurane in bariatric fasttrack surgery Frank Weber (NO), D Kollerøs, CE Bjerkelund, J Kristinson F Schou	
1200 – 1210	FP01.07	Psychological preparation for the ophthalmic patient before cataract operation. Suggestive techniques & guidelines during the procedures Eszter Kovacs (HU), E Jakubovits, M Janecsko, ZZ Nagy, K Gombos	
1210 – 1220	FP01.08	Multimodul postoperative pain management for open inguinal hernia repair with mesh implantation in day surgery Gamal-Eldin Mohamed (HU), M Janecskó, M Murányi	
1220 – 1230	FP01.09	Impact on catheter-related complications and quality of life: three different sites of port insertion (oncology patients). Single centre randomised trial Simonetta Pozzi (IT), F Orsi, G Bonomo, P Della Vigna, L Monfardini, D Radice, MG Zampino, N Fazio, A Maldifassi, N Rotmensz, F Didier, R Biffi	
1330 – 1500	FP02	Free Paper II Mod. Claus Toftgaard (DK) + Luc Van Outryve (BE)	Session room 11
1330 – 1340	FP02.01	Laser Surgery for Varicose Veins Imre Bihari (HU)	
1340 – 1350	FP02.02	Laparoscopic treatment of incision hernias as one day surgery with Proceed mesh Slobodan Jovanovic (RS), V Pejic, M Djordjevic, T Bojic, D Bogdanovic, A Pavlovic, B Jovanovic (TBC)	
1350 – 1400	FP02.03	Laparoscopic Inguinal Hernioplasty - Experience of an Ambulatory Day Surgery Unit Carlos Magalhães (PT)	
1400 – 1410	FP02.04	PVP Mesh Ventral Hernia Repair in Ambulatory Surgery. Our Preliminary Experience Jorge Vásquez Del Aguila (ES), C. Semeraro, F Landi, M. Lopez-Cano	
1410 – 1420	FP02.05	Is gynaecological laparoscopy safe in a free-standing surgical center? György Gerő (HU), A Bencsik, K Nagy, ME Gamal, A Kovács, M Janecskó	
1420 – 1430	FP02.06	Vaginal Hysterectomy as a Routine Ambulatory Surgical Procedure Marianne Glavind-Kristensen (DK), S Greisen, UT Larsen, S Felsby, C Poulsen, SM Axelsen, KM Bek	
1430 – 1440	FP02.07	Spinal minimally invasive day surgery procedures. Experiences with 1000 procedures Laszlo Iazar (HU)	
1440 – 1450	FP02.08	Day case stapled mucosal anopexy for the treatment of haemorrhoids and rectal Luis Hidalgo (ES), A Heredia, J Carbonell, O Estrada, E García, S Llorca, X Suñol	
1450 – 1500	FP02.09	Modern management of haemorrhoids in a specialty day care centre Manmal Begani (IN), D Mulchandani	
Tuesday 10 May 2011			
1530 – 1700	FP03	Free Paper III Moderators: Carlo Castoro (IT) + Robert Williams (US)	Session room 11
1530 – 1540	FP03.01	Emergency day case surgery: a new oxymoron? Kenneth Coenye (BE), L Van Outryve	
1540 – 1550	FP03.02	Cataract surgery-the medical profile of cataract patients Maria Janecskó (HU), G Németh, K Nagy, E.M. Gamal	

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1550 – 1600	FP03.03	Initial results of a thyroid day surgery program in a local hospital: experience matters. Josep Martí (ES), S Llorca, L Hidalgo, J Barja, M Prats, J de la Cruz, X Suñol
1600 – 1610	FP03.04	Patients' experiences of the social aspects of Day Surgery Anne Mottram (UK)
1610 – 1620	FP03.05	New possibilities in the introduction of cost-weight based, performance oriented financing system in ambulatory surgery György Polyvás (HU), M Gamal-Eldin
1620 – 1630	FP03.06	Less Invasive Signature Arthroplasty (LISA) Emmanuel Thienpont (BE)
1630 – 1640	FP03.07	Benchmarking Day Surgery Performance in the UK Mark Skues (UK)
1640 – 1650	FP03.08	Pioneering Day Surgery in a Developing Country-IN Naresh T Row (IN), P G Dande, N Bondray, S P Dande
1650 – 1700	FP03.09	Well-being among staff at daysurgery units in central Sweden Yvonne Wahlberg (SE)

Remifentanyl versus fentanyl for propofol-based anaesthesia in ambulatory surgery in children

Anita Solheim^a, Johan Raeder^{a,b}

Abstract

Aim: To test whether remifentanyl results in significantly more rapid emergence in children anaesthesia.

Methods: In forty children, age 1–6 yrs, general anaesthesia was induced and maintained with propofol. The patients were randomized to receive either fentanyl 2 µg/kg at start and then 1 µg/kg as needed or remifentanyl 1 µg/kg bolus followed by infusion of 0.5 µg/kg/min.

Results: The remifentanyl patients had significantly less signs of minor movement at start of surgery, lower heart rate, lower systolic blood-

Keywords: General Anaesthesia, Remifentanyl, Fentanyl, Children, Ambulatory Surgery.

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pressure, less total dose of propofol during the procedure and higher need of postoperative opioid pain rescue.

Conclusions: Remifentanyl, as dosed in this study, did not result in clinical significant benefits.

Introduction

Propofol and opioid anaesthesia in children are preferred by many anaesthesiologists in Norway due to the lower incidence of post-operative agitation, pain and nausea when compared with inhalational techniques [1,2]. However, the traditional opioid anaesthetics such as sufentanil or fentanyl have been associated with side-effects due to prolonged opioid effect; such as delayed emergence, delay in spontaneous breathing and respiratory control as well as cases of opioid induced nausea or vomiting [1,3]. Remifentanyl, being a very short acting opioid, should potentially result in fewer of these side effects while also allowing for higher opioid dosing and better control of stress response and haemodynamics during the surgical procedure. In a review of different opioids for adult general anaesthesia in 85 trials and 13,057 patients, the remifentanyl patients had clinical signs of deeper anaesthesia, i.e. less occurrence of haemodynamic stress response during surgery but also more episodes of hypotension and bradycardia [4]. Postoperatively, remifentanyl was associated with more rapid emergence and less respiratory events, but more need of supplemental analgesics, whereas nausea or vomiting occurred with similar frequency as with the other opioids [4].

In children there is less documentation on the potential clinical outcomes of using remifentanyl instead of fentanyl as a supplement during propofol based anaesthesia, although a meta-analysis in 2006 concluded on remifentanyl as a safe and effective alternative in children [5].

The purpose of our study was to compare remifentanyl with fentanyl for emergence as well as perioperative haemodynamic variables and side-effects during elective ambulatory surgery in children given propofol infusion anaesthetic with a non-opioid multimodal analgesic regimen.

Methods

The protocol of this randomized, double blind study was reviewed and approved by the Regional Committee for Medical Research Ethics in Eastern Norway.

ASA I children (1–6 years) scheduled for elective surgery of hernia, testicular retention or hydrocoele were included after written informed consent had been obtained from the parents.

Exclusion criteria were regular use of any drugs or known contraindication to any planned medication or anaesthesia method.

All patients received local anaesthetic pads (EMLA®, Astra-Zeneca, Sweden) on dorsum of both hands or feet at least 60 min before start of anaesthesia and oral premedication with midazolam 0.5 mg/kg 30–60 min before start of anaesthesia.

All patients received an IV cannula before start of anaesthesia, while sitting on parent's knee. Then propofol 3 mg/kg was given, immediately followed by opioid per their randomized allocation (see below, Group allocation). A facemask or a laryngeal mask airway (LMA) was inserted and the patients were normoventilated with 30% oxygen in air throughout the procedure. Intravenously paracetamol (Perfalgan®) 20 mg/kg was given in a separate cannula immediately after induction of anaesthesia. Propofol 15 mg/kg/hr infusion was given initially for maintenance of anaesthesia, and then adjusted to maintain BIS values between 45 and 55. Opioid was given as either fentanyl in repeated bolus dosing or remifentanyl by infusion (see below).

At start of final wound closure, propofol infusion and opioid infusion or supplements were stopped. Bupivacaine, 0.5 ml/kg of 2.5 mg/ml was infiltrated locally in the surgical wound by end of surgery. Patients with testicular retention received a sacral block with bupivacaine 1.67 mg/ml, 1 ml per kg weight, maximum 20 ml. For postoperative pain relief paracetamol 20 mg/kg was given rectally every 6 hr if needed, and while in the unit with IV ketobemidone 0.05 mg/kg.

Subjects were randomized to receive per-operative opioid supplement with either fentanyl (Group F) or remifentanyl (Group R)

based on computer-generated code stored in sequentially numbered, sealed envelopes which were opened immediately before start of anaesthesia. The nurses who registered postoperative data were blinded as to group allocation of the patients.

In Group F a starting dose of fentanyl 2 µg/kg was given IV as part of anaesthetic induction. Additional supplements of fentanyl 1 µg/kg were given by start of surgery and additionally throughout surgery, upon any sign of movement or heart rate or systolic blood pressure above 130% of resting value.

In Group R, remifentanyl was given as continuous IV infusion, starting during induction with a bolus of 1 µg/kg, then 0.5 µg/kg/min initially. The infusion rate was adjusted up upon any sign of movement, or heart rate or systolic blood pressure above 130% of resting value, and adjusted down by signs of hypotension or bradycardia. During induction, time to loss of eyelash reflex was registered, as well as reactions to LMA insertion, any signs of movements, tears or abnormal vital signs (i.e. BP, heart rate, pulse oxymeter reading). Any reaction upon start of surgery was noted as well as regular recordings of vital signs and BIS through the procedure. After end of surgery the time to spontaneous breathing, removal of laryngeal mask, emergence and discharge from the OR were noted, as well as any signs of physical or emotional distress. In the postoperative care unit, times to sit and eating ice cream were noted, as well as regular evaluation of pain, agitation and retching/vomiting using a 4-point verbal scale: none-little-medium-much-very much. As judged by the trained postoperative nurse, ketobemidone 0.05 mg/kg was given iv when needed for clinical signs of pain. Time to home discharge readiness and actual discharge were noted.

Statistics: Time from end of surgery until eyes opening during emergence was the primary efficacy variable. We wanted to show with significance of 0.05 if any group had a mean reduction in this variable by 50%, with a standard deviation of mean in both groups of 50%. With 20 patients per group a power of 90% was calculated for revealing such a difference. The data set was analyzed using independent samples T-test for continuous variables with nearly normal distribution; otherwise the Mann-Whitney U-test was used. The Chi-square test was used for categorical data. Repeated measures ANOVA was used for VAS scores and sedations scores. Data were analyzed in SPSS 16.0. The significance level was set to 0.05.

Table 1 Demographic and preoperative data (mean ± SD) or n.

	Group F (n=20)	Group R (n=20)	
Age (yr)	3.1 ± 1.6	4.3 ± 2.0	(P=0.08)
Weight (kg)	15 ± 5.1	18 ± 6.0	
Gender (boy/girl) (n)	15 / 1	14 / 1	
Tired before induction (n: yes/no)*	18 / 2	19 / 1	
Paracetamol dose (mg)	295 ± 92	355 ± 117	
Preop heart rate (beats/min)	106 ± 21	96 ± 23	(P=0.12)

*The anaesthetist should evaluate if the child appeared normal or tired.

Results

Forty patients were studied per protocol for the planned peroperative and postoperative period (Fig. 1). Demographic and preoperative data were similar in the two groups (Table 1). Dose of local anaesthetic as well as type and duration of surgery were also similar (Table 2). The doses of propofol were lower in Group R.

The remifentanyl patients had significantly less movements at start of surgery, and lower values of blood pressure and heart rate during the procedure (Table 2). There was wide variability in the time to resume spontaneous ventilation. Postoperatively, the time to emergence, transport out of OR, time to sit and time to discharge and discharge readiness were similar in the 2 groups (Table 3). Postoperative pain and incidence of vomiting were also similar, but significantly more patients in the remifentanyl group needed rescue opioid before discharge (25% versus 55%) None of the patients needed more than 2 doses of iv rescue opioid (Table 3). Time to eat ice cream in the remifentanyl group was significantly shorter than for fentanyl (91 ± 37 vs 120 ± 42, mean ± SD, P=0.03).

There were no serious side-effects in any patient.

Discussion

There were no serious problems or complications in any of the children studied.

Our study showed that remifentanyl allowed for deeper and stronger general anaesthetic effect during surgery with few differences between the groups postoperatively. More remifentanyl subjects needed rescue analgesia postoperatively but had significantly shorter time to eat ice-cream. There were no serious problems or complications in any of the children studied.

As both remifentanyl and fentanyl are considered to be pure µ-agonists [5], there should be no difference in quality of effect or side-effects at strictly equipotent doses. Thus, with a higher dose of fentanyl it would most probably not be any problem to match the absence of movements and the low values of blood-pressure and heart rate seen with remifentanyl in our patients. In a study of intubation in children, less stress response was shown with remifentanyl [6] whereas a study on cardiac children surgery showed similar haemodynamics with remifentanyl when compared to fentanyl [7]. Our study may thus be criticised for not having used equipotent per-operative dosing, in order to visualize the potential benefits of rapid elimination of remifentanyl. Still, the fentanyl dosing used in our study seemed to be adequate, there were only one child (as with remifentanyl) with a medium reaction to start of surgery, and only two cases with episodes of moderate hypertension or tachycardia (ns).

The equipotent doses of remifentanyl versus fentanyl is hard to calculate, as remifentanyl has a more rapid onset and a very much more rapid offset and elimination than fentanyl. In a study of equianaesthetic doses of fentanyl vs remifentanyl in adults, Vuyk found a dose relationship of 3:1 during induction, but 1:8–10 during maintenance for 30 min [8]). In our study the induction dose rate was 2:1 and the maintenance 1:15, thus the opioid effect of remifentanyl should be expected to be stronger. Then, the question will be if we should have reduced the remifentanyl dose. We had two cases of hypotension or bradycardia in the remifentanyl patients (ns), but an almost significant prolongation of apnoea after end of surgery (3.6 min vs 0.9 min after fentanyl, P=0.07) suggesting that the opioid effect from remifentanyl dosing certainly were stronger at that point. There were no indications of severe residual opioid respiratory or haemodynamic effects with remifentanyl, as the LMA removal and discharge from OR were similar in both groups. In a study of

Table 2 Peri- operative data (mean \pm SD) or n.

	Group F (n=20)	Group R (n=20)	
Time to loss of eyelash reflex (sec)	11 \pm 5.9	17 \pm 2.7	
Movements at start of surgery (none/small/medium/strong)	6 / 13 / 1 / 0	17 / 2 / 1 / 0	P=0.002
Type of surgery (n)			
Inguinal hernia	9	11	
Testicular retention	8	8	
Testicular hydrocoele	2	1	
Umbilical hernia	1	0	
Duration of surgery (min)	28 \pm 11	24 \pm 5.7	
Caudal anaesthesia (yes/no)	7 / 12	7 / 13	
Highest heart rate (beats/min)	119 \pm 22	97 \pm 21	(P=0.003)
Lowest heart rate	95 \pm 16	75 \pm 14	(P=0.001)
Average heart rate	105 \pm 17	85 \pm 91	(P=0.003)
Bradycardia (< 60/min, n)	0	1	
Tachycardia (>150/min, n)	2	0	
Highest systolic BP (mmHg)	95 \pm 8.1	83 \pm 7.9	(P=0.001)
Lowest syst BP	79 \pm 8.9	69 \pm 8.4	(P=0.01)
Average syst BP	87 \pm 6.5	76 \pm 5.4	(P=0.001)
Hypertension (>110, n)	1	0	
Hypotension (<60, n)	0	2	
Lowest oxygen saturation (%)	97 \pm 4.3	97 \pm 4.1	
Patients with sat <90% (n)	1	1	
Total propofol dose (mg)	206 \pm 64	206 \pm 64	
Propofol dose; mg/kg	14 \pm 5	10 \pm 6	
Total time in OR (min)	50 \pm 14	47 \pm 9.3	

Table 3 Post- operative data (mean \pm SD) or n:.

	Group F (n=20)	Group R (n=20)	
Time to spontaneous breathing (min*)	0.94 \pm 3.9	3.6 \pm 4.6	(P=0.06)
Time to LMA removal	4.1 \pm 3.7	5.1 \pm 5.1	
Out of OR (min*)	7.9 \pm 4.0	9.7 \pm 4.6	
Awake (min *)	63 \pm 27	50 \pm 27	(P=0.09)
Able to sit (min *)	113 \pm 44	108 \pm 28	
Able to eat ice-cream (min *)	119 \pm 42	91 \pm 37	(P=0.03)
Pain (no/minor/medium/much)	5 / 8 / 1 / 4	4 / 6 / 7 / 2	(P=0.05)
Need of rescue opioid (n)	5	11	
1 dose / 2 doses	3/2	6/5	
Restless (no/minor/medium/much)	8 / 4 / 3 / 4	8 / 4 / 3 / 4	
Vomiting (n)	0	2	
Home ready (min *)	207 \pm 53	207 \pm 53	(P=0.09)
Sent home (min *)	227 \pm 51	213 \pm 66	

* Min after end of surgery.

tonsillectomy in ENT children, Davis et al were able to show more rapid extubation after remifentanyl when compared to fentanyl, but also at the cost of more postoperative pain [9].

The mean time to emergence of 4–5 minutes in both our groups may seem long, but may be a result of the standardized research setting where propofol was running until end of surgery. In a clinical situation most anaesthesiologist will taper down the infusion rate towards end of surgery and eventually stop the pump before the last suture is done.

In terms of post-operative characteristics of remifentanyl as a shortacting opioid, we confirmed previous studies showing that the need of rescue analgesia was higher than with fentanyl, in 11 vs 5 patients ($P=0.5$). This was in spite of multimodal non-opioid pain prophylaxis with iv paracetamol, local anaesthesia wound infiltration or many cases with caudal analgesia. The incidence of vomiting was negligible, only 2 patients among the 40 studied, both in the remifentanyl group. Recording nausea is a more sensitive variable than vomiting, but as nausea is a subjective experience expressed verbally, it is hard to study in young children. After procedures with a high incidence of vomiting, such as strabismus surgery in children, Eltzsig et al showed less episodes of vomiting when fentanyl was replaced by remifentanyl [10]. An indication of low incidence of nausea in our study was that all children were able to eat ice-cream within 2–3 hrs postoperatively. Although significantly sooner in the remifentanyl group, this may be a coincidental finding as the p-value of significance was only 0.03.

In terms of home readiness, there were no significant differences between the groups, all children being sent home within 4–5 hours after the procedure. This long mean time before discharge is due to the children usually being accompanied by one parent in the recovery unit, and usually allowed to stay there until one more parent or relative arrives in the afternoon for assistance during home travel.

Fentanyl is cheap, ready for use and was given by simple bolus dosing due to a more smooth and slow onset and offset. Remifentanyl is a little more demanding, it has to be prepared from powder and preferably given by a syringe pump. A fentanyl ampoule of 100 µg costs about 1.2 euro, whereas the smallest glass of 1000 µg remifentanyl costs about 9 euro. As the remifentanyl vial may be divided into 4–5 patients and fentanyl into 2 patients, the minor cost level and difference between these drugs become rather negligible in the context of all other direct and indirect costs associated with a surgical case in a child.

In conclusion, with our dosing schedule of remifentanyl or fentanyl, the clinical characteristics came out quite similar. Still, remifentanyl may allow for better control of haemodynamics and stress response during surgery, but may be associated with more need of postoperative opioid rescue.

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