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An anesthetic data acquisition system in ambulatory surgery

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Abstract

Rapid access to and analysis of information constitutes an important element in the health care quality of an ambulatory surgical unit. We have developed a database for application to ambulatory anesthesia, based on commercially available software (Claris File Maker Pro 3.0, allowing full compatibility between Apple Macintosh and PC systems). Three integrated bases are used (preanesthesia, anesthesia and postanesthesia), and the different fields are automatically introduced by order. The design is open and allows for subsequent modifications; reports may be presented, and direct telephone communication is facilitated, along with net-based operations.

Keywords: Outpatient anesthesia; Ambulatory surgery; Data encoding; Quality assurance; Medical record systems; Data acquisition systems

1. Introduction

Ambulatory surgery in the form of ambulatory surgery centers was introduced in the late 1960s in the US, followed a decade later by freestanding ambulatory surgery centers. However, in Europe, and particularly in Spain, where health care is predominantly public, the implementation of ambulatory surgery was relatively delayed. In Spain ambulatory surgery has been based upon two main guidelines. In 1993, the Spanish Ministry of Health, via the Dirección General de Aseguramiento y Planificación Sanitaria (General Directory on Insurance and Health Care Planning) set out the organizational and functional basis for the implementation of ambulatory surgery [1]. That same year, the Academy of Medical Sciences of Catalonia and the Balearic Islands published the conclusions of their Commission for the development of protocols and recommendations for ambulatory surgery [2]. Both documents address the problems posed by data acquisition, with the definition of a minimum number of items that needed to be recorded. In effect, the second document, in Section 1.4.6 (Information Systems) states that "in addition to the information collected by conventional means for hospitalized patients (medical records, operating room data sheets, etc.), day surgery units must record for each operation a minimum set of data to adequately document the activities, number of procedures and type of ambulatory surgery performed". The analysis of such activities, the problems posed and rapid access to information are all major elements in health care quality assurance.

The present study develops a database that is both versatile and easy to use, and specifically addresses anesthesia in patients subjected to ambulatory surgery.

2. Material and methods

Commercial software in the form of the Claris File Maker Pro 3.0 program for Apple Macintosh and PC based systems is used. The Mac and Windows NT 3.51 and 95 multiplatform secures the operability and 100% compatibility of both systems. As many as 50 datafiles may be opened simultaneously, with up to 2 Gb per

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file, i.e. the data storing capacity is practically unlimited. The system supports different networks (Apple Talk, IPX/SPX and TCP/IP) for data sharing among users. Files can in turn be imported and exported in DBF, SYLK and WKS1 format (WKS being limited to importation) as well as in PICT, TIFF or EPSF graphic form.

A pre-established model is used for data presentation, thus facilitating the process and improving the esthetic effects.

3. Results

Data are presented in three integrated bases (preanesthesia, anesthesia and postanesthesia), accessible from the start as folder separators. The heading common to all screens contains general data, and the different variables considered are included in Table 1.

Table 1
Database variables corresponding to preanesthesia, anesthesia and postanesthesia

General data	
7. Preanesthesia date	18. Interventions
0. Identification number	4. Birth date
1. First name	5. Medical record number
2. First family name	6. Accompanying person
3. Second family name	
Preanesthesia	
7. Preanesthesia date	18. Interventions
8. Address	19. Prior complications
9. Telephone number	20. Allergies
10. Speciality	21. Transfusions
11. Type of operation	22. Pregnancy/breast-feeding
12. ASA status	23. Prostheses/contact lenses
13. Age	24. Antecedents
14. Sex	25. Medication
15. Weight	26. Laboratory tests
16. Height	27. ECG
17. Systolic/diastolic blood pressure/heart rate	28. Premedication
Anesthesia	
29. Date of surgery	33. Activity times
30. Surgeon	34. Postponements
31. Anesthesiologist	35. Drugs
32. Technique	36. Problems
Postanesthesia recovery	
37. VAS on admittance	42. Destination
38. VAS on discharge	43. Observations
39. Aldrete on admittance	44.Postanesthesia recovery drugs
40. Aldrete on discharge	45. Complications
41. Duration of stay	

Table 2
Lists of options corresponding to variables 25, 32 and 36 (medication, technique and problems, respectively)

No. 25 (medication)	No. 32 (technique)	No.36 (problems)
Digitalic drugs	Local	Intubation
Diuretics	Regional	Aspiration
Blockers	Plexus	Bronchospasm
Antiarrhythmic agents	Peribulbar	Laryngeal spasm
Tranquilizers	MAC	Hypotension
Antidepressive drugs	Sedation	Hypertension
Oral hypoglycaemics	IVRA	Arrhythmia
Insulin	General	Cardiac arrest
Bronchodilators		Displ. delay
Corticoids		Pain
Hormones		Bleeding
Hypotensive drugs		Nausea/vomiting
Others		Others

In most cases the fields correspond to the variables, and have been previously defined as possessing the following formats:

(1) Text (numbers 1–3, 10 and 11): the fields corresponding to antecedents (number 24), laboratory tests (number 26) and drugs (numbers 35 and 44) are presented visually and are in turn subdivided. 'Antecedents' comprise of cardiological, respiratory, metabolic, renal, hepatic/digestive and neuropsychiatric. 'Laboratory tests' include hematocrit, hemoglobin, red cell, glucemia, urea, quick index and APTT, while under 'drugs' administration in either anesthesia or postanesthesia is specified; an extensive list of options is provided that covers most of the agents used (induction, anesthetic gases, analgesics or muscle relaxants). The fields in turn record the names of both the surgeon and anesthetist.

(2) :Number (numbers 5, 9, 13, 33 and 41).

(3) :Date (numbers 4, 7 and 29).

(4) :List of possible options (select) (numbers 14, 22, 23, 25, 32, 36 and 45) (see Tables 2 and 3).

In turn, the lists pertaining to 'problems and complications' reflect severity (rated 1–3). The field corresponding to 'identification number' is protected and is self-introduced with each new record. This avoids the

Table 3
Lists of options corresponding to variable 45 (complications)

Respiratory	Neurological	Others
Dysphonia	Headache	Allergic reactions
Laryngeal spasm	Agitation	Bleeding
Bronchospasm	Convulsions	Persistent pain
Aspiration	Coma	Urinary retention
Respiratory depression	Prolonged block	
	Paralysis	
	Shivering	

exclusion of records and secures chronological order. The total number of optional fields exceeds 120, and each field is automatically accessed in sequence by pressing the tab key. This order may be modified at will. On the other hand, the database design is open and allows for subsequent modifications of all fields as required. The reports may in turn be generated using different field selection criteria, in the form of lists, forms, mailing lists, etc. Direct telephone (modem) transmission and net-based operations are also possible.

4. Discussion

The existence of databases such as that described in the present study is not new, as reflected by the publications on information recording and processing [3,4]. In turn, different authors have addressed aspects such as the complications, application methods [5] and specific situations involved (e.g. obstetric anesthesia) [6].

The University General Hospital of Valencia, Spain, has 600 beds and covers the health care requirements of a population of 326000. However, it should be pointed out that this hospital is the reference center for all specialities corresponding to two geographically nearlying health care areas (with 48000 and 177000 inhabitants, respectively). As a result, the total dependent population is between 400000 and 450000.

A total of 5655 operations (excluding emergency surgery) were performed under general anesthesia in the course of 1995. In this context, analysis of the different surgical specialities and interventions suggests that 25–30% of these operations could be performed on an ambulatory basis. Consequently, the introduction of a functionally autonomous ambulatory surgical unit physically pertaining to the hospital has been planned, based on criteria involving consensus among the different hospital sectors and specific functions [7].

We are of the opinion that the proposed computerized data acquisition system may be of use for a number of reasons. On one hand, the program is very intuitive and easy to use (in the line of Apple Macintosh software in general). Claris File Maker Pro 3.0 operates on Power Macintosh or Apple Macintosh computers with system 7.0 or higher, as well as on PCs under Windows NT 3.51 or 95. Requirements are a hard disk, CD-ROM and 8 MB RAM (16 Mb advisable in the case of Windows NT 3.51 based systems). A customized database design is used, left open to subsequent modifications according to needs, including the introduction of new fields and variables.

As an example, this study, in principle, includes the names of the specialists involved in each case, despite controversy over whether or not the surgeon and anesthesiologist should remain anonymous. In this context, their inclusion allows for self-evaluation, with the production of individualized reports where required. On the other hand, the inclusion of these names could cause specialists to deliberately omit certain problems or complications, thus giving rise to inexactness. In any case, such fields may easily be protected by passwords.

The program may be integrated in PC based networks, with the sharing of files among Windows or mixed system workgroups. Data may in turn be exported to other databases or formats and subjected to processing with the most commonly used statistical packages [8].

The University General Hospital of Valencia presently possesses a data acquisition system, though limited to administrative (i.e. financial and management) activities. On the other hand, the general computerization of the service of anesthesiology has not yet been implemented in our hospital. In this sense, the Norwegian Association of Anesthesiologists has developed and distributed an application for the acquisition of both administrative and anesthesiologic information [4]. However, such alternatives limit versatility by producing dependency upon larger databases structured outside of the context of the anesthesiology unit and to which the additional desired items must be added.

The application of the system proposed in the present study would secure important gains in health care quality assurance. Analyses could be performed of the causes of cancellations [9], admissions and/or readmissions in relation to the current discharge criteria [10]. On the other hand, bypasses in patient circuits would be avoided, including specific evaluation on the part of the anesthesiologist [11,12] and the systematic collection of data [13]. This aspect is of particular interest in units of this kind, as pointed out by authors such as Enlund [14]. In this sense, the proposed system facilitates information exchange between the physician and patient or relatives, thereby contributing to the avoidance of confusion that might give rise to medical-legal problems [15]. In addition, it becomes possible to identify and re-evaluate routine medications administered over long periods of time to elderly patients suffering from chronic diseases.

Different protocols, anesthetic techniques and drugs may be evaluated for safety, patient comfort and length of stay within the unit [16]. Lubarsky et al. [17] have developed a computerized system and/or the evaluation of anesthetic costs. Their aim for the future is to select those anesthetic practices capable of securing the best possible outcome and patient satisfaction. To this effect, the acquisition of a large number of data and their corresponding computer processing is essential.

Knowledge of the variables introduced is important for the incorporation of future changes [18] to patient selection [19] methodology and data acquisition (e.g. as when investigating concrete phenomena) [20]. In this context, a major concern is that the introduction of

such systems may increase the load on already overburdened staff. Although according to some authors these systems would actually create work incentive [21], others advocate avoiding separate data collection sheets [22]. In our case, the general data and part corresponding to preanesthesia would be recorded in the consulting room prior to the intervention by the anesthesiologist in charge of informing the patient and obtaining written consent. The rest of the information would subsequently be collected from the anesthesia sheet and postanesthetic evaluation form by the specialist in charge of signing the discharge. This approach to data acquisition would secure the correct selection and interpretation of the data recorded.

Landais et al. [23] believe that the time has come to introduce working networks and new monitorization and/or ventilation systems with outputs for the automated recording of data. This would moreover allow intercommunication between operating rooms, postanesthesia recovery wards, etc. However, other authors [24] are concerned that the elimination of manual data collection procedures may actually contribute to lower levels of vigilance. The reliability of such procedures has also been questioned [25].

In conclusion, although the implementation of an anesthetic data acquisition system in ambulatory surgery represents extra work, we are of the opinion that it may secure improved health care quality by allowing for periodic activity monitorization and problem detection. This aspect is particularly important for the introduction of changes in protocol. On the other hand, such a system may stimulate an increase in the scope of data collected, with the aim of improving our capacity to deal with the challenges posed by this type of surgery.

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