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”Imaging the Future Medicine”

Track 24 Clinical Engineering, Technology assessment II

The clinical engineering department (CED) as a service provider, what is the cost?

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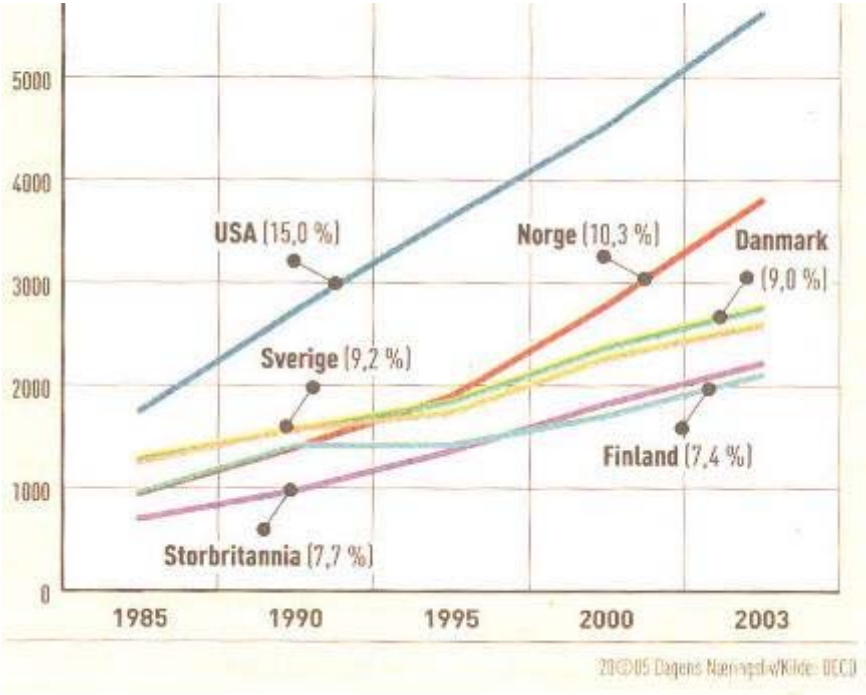
Cost expansion in national health budgets

Cost for national health services (USD)

Corrected for rel. buying power 2003 (OECD data)



Escalating costs

…thus: an urge for cost containment!

Our motivation:

The Clinical engineeering department is responsible for the budget and the services associated with the medical equipment and the total management of medical technology. Tight budgets stress us to be absolutely sure that we deliver the required service to a known, and limited cost.

Introduction

In many countries, a Clinical engineering department (CED) within the hospital is an in-house provider of clinical engineering services (CES) and technology management. This organisation has the effect that it is possible to collect complete data for the costs of running the business.

Cost-effective, efficient and safe use of medical devices comprise several targets: Economy, **but also** Safety, Quality systems, and Procurement. All processes have to be managed, their cost calculated, and included in the total cost figure.

In this study, the accumulated cost of running all required equipment-related operations as a percentage of the accumulated procurement cost of the equipment, is used as a benchmark reference for comparison of different CED service provisions.

My lecture adresses some methodological problems in doing benchmark studies of a service provider, and I am presenting the results from a norwegian multicenter benchmark study of CES-cost, and a comparison with scarecly available international data.

Why? Some comments on benchmarking of service?

- Simply another word for measuring, normally used in comparison of service products.
- It is interesting, and in a competing situation necessary, to know the cost of the service you are providing. Especially, it is vital to measure it against the average or against the best practice in the field. These data are vital for you to know - if your organisation has the potential for economic improvement compared to others – or are you increasing or decreasing compared to your own standard?
- Are your owner or your clinical customers willing to pay the bill for your service? When is the service level so low that the customer is not accepting it, and is willing to pay more? Or is a minimum level determined by laws and regulations (different national regulations)?
- Would your clinical customer like to have a Service Level Agreement? How do you measure your deliveries?
- A low rating in a benchmark of a service provider is often the start of a process where the owner outsources or merges activities. A benchmark process and a ”positive” outcome is thus possibly vital for survival.
- The ongoing european movement of NPM – new public management, and in Norway (as in many countries), the enterprisation of public services like hospitals, accelerates the interest in cost containment and measurements of service cost; i.e. benchmarking, compared to a given level of practice.

Methodological problems benchmarking CES

- There exist benchmark references for ”best-practice” of most common service provisions in different countries, regions or worldwide. All large consulting companies have their own databases. In Norway we have experience in hospitals with IBM, PWC and McKinsey. Typical available data are of type cost per invoice treated in the economic department, number of telephones handled per minute in a switchboard etc.
- Though, for complex services there are not many good sources of data, and there exists national differences. This is the case for the services delivered by a CED, the CES. It demands deep professional insight into engineering and service processes to make a valid benchmark of CES.
- To be able to compare, the analyst must be completely certain that the entities are completely comparable. In our context some examples, that: the collection, population or grouping of the medical equipment studied is the same, the cost of the equipment is calculated in the same way (e.g. how do you handle cost that was payed 12 years ago?), are all spareparts included (e.g. costly X-ray tubes), is contracted service included, is the agreed response time the same, are teaching medical hospitals delivering other services, is the cost per hour different in rural areas, are public demands different in different countries or regions, is the organisation of the service provider the same? Etc etc.
- **Unless you are absolute sure about these variables, the benchmark is useless and worse: probably wrong!**

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Processes included in the cost within the term

CE "service"

NORDIC GUIDELINES GCEP
MAIN PROCESSES FOR CLINICAL ENGINEERING PRACTICE

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The main processes are designed to satisfy the demands from the main CED customer(s). The processes are divided into different activities designed to improve the medical services. The main processes are parts of the infrastructure for successful use of medical devices in diagnoses, treatment and care. They are:

1. Strategic planning
2. Procurement
3. Device management and support in clinical use
4. Disposal of medical devices
5. Knowledge management
6. Research and development of medical devices

Methods

- According to GMDN, there exist more than 18.000 different terms for medical devices. The GMDN is still under translation and lots of different inventory systems exists. It is very likely that the same equipment is categorized differently in different locations and inventory systems. Also, since e.g. a CT may be recorded as 1 unit or as a collection of all the subunits, we thus avoid using mean cost per equipment unit.
- Data sets have to be sufficiently densely populated to allow statistical effects to smooth the variations.
- At Rikshospitalet-Radiumhospitalet and in the CED-network group of our region (7 hospitals in Health South) we have tried different benchmark indicators during the last 20 years. To avoid a long discussion on indicators that did not work consistently, the conclusion is: **The one and only most consistent and reproducible indicator is the Main indicator presented as a %: Total cost of all CES in the hospital (= the cost of all medical equipment related activities, budgets or accounts - even if they are not under CED) divided on the accumulated procurement cost, without mathematical corections of age, interest rate, capital depreciation etc.**

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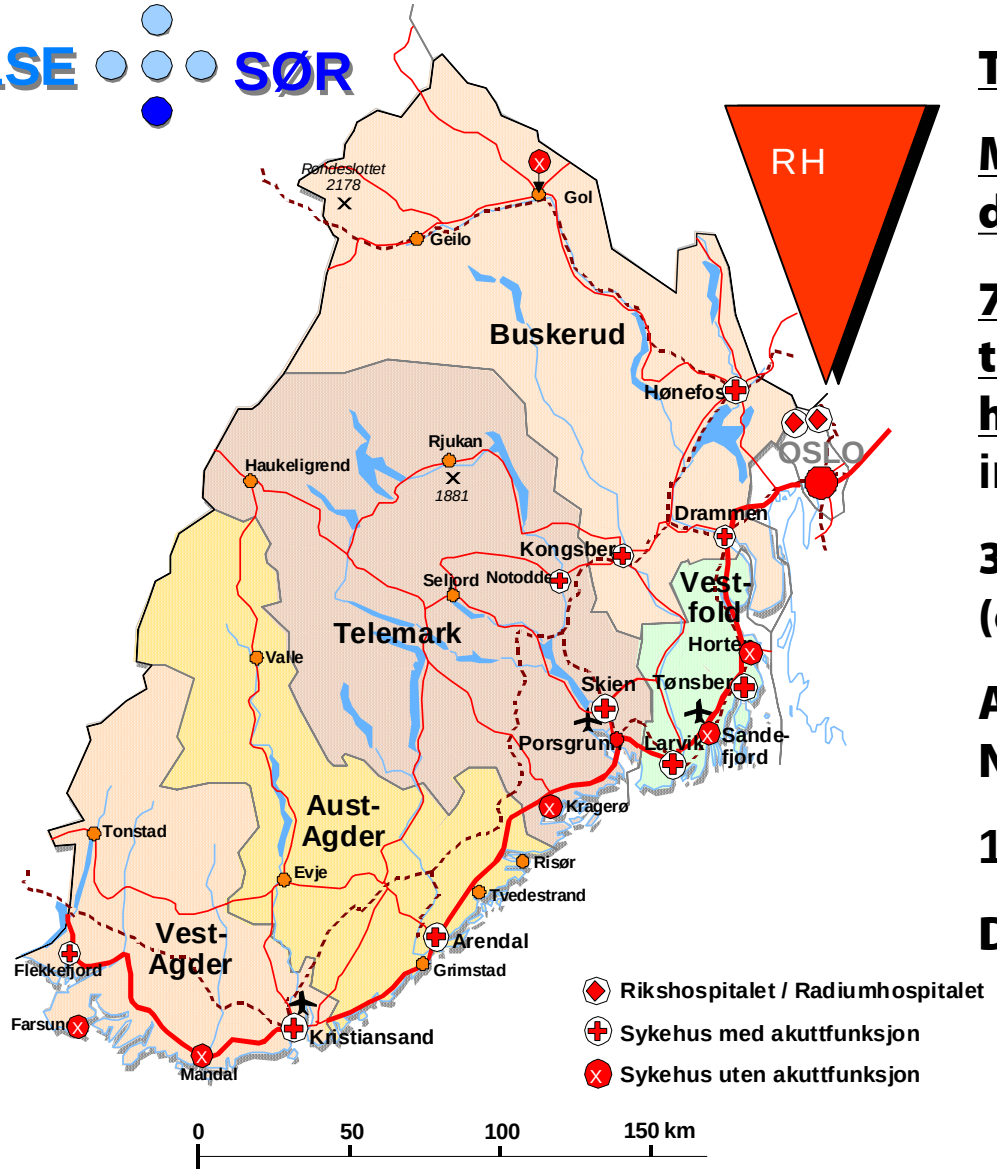


The Norwegian

Multi-center equipment dataset:

7 hopitals: 2 national teaching/university, 5 district hospitals (Approx. 2 mill inhabitants live in the area).

39.536 equipment units (estimated 97 % of existing)

Acc. proc. value 3,134 bill NOK = 400 mill USD/euro

1 USD = 1 euro = 8 NOK

Data sets from 1.1.2005

Results - 1

Main indictor = Percentage cost of all CES divided by accumulated equipment procurement cost:

Main indicator 2005 = 4,2 %

(span 3,3 % - 4,7 % for all 7 hospitals).

Main indicator 2002: 4,0 %

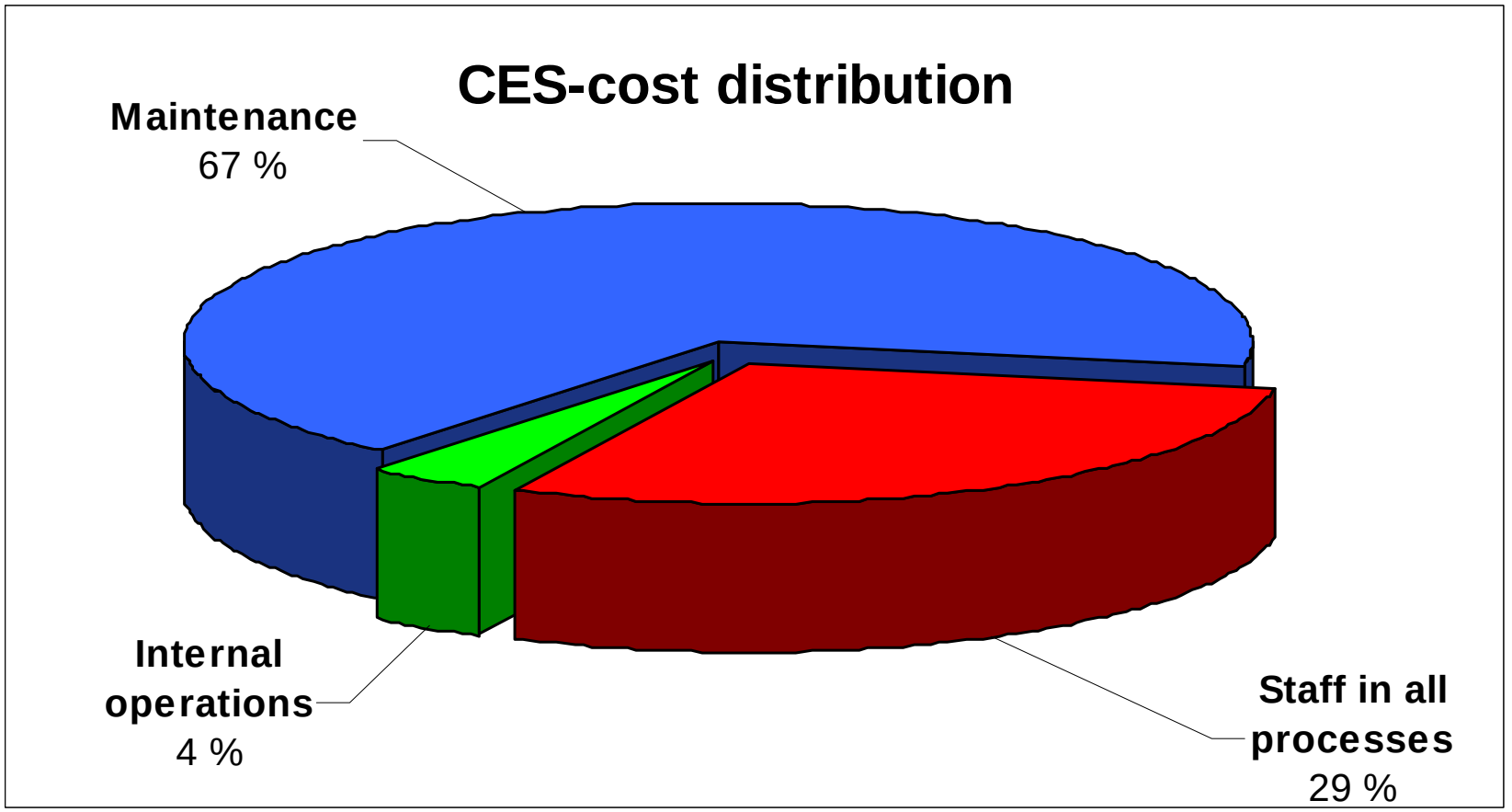
Results - 2

Distribution of man-years per service category multi-center total

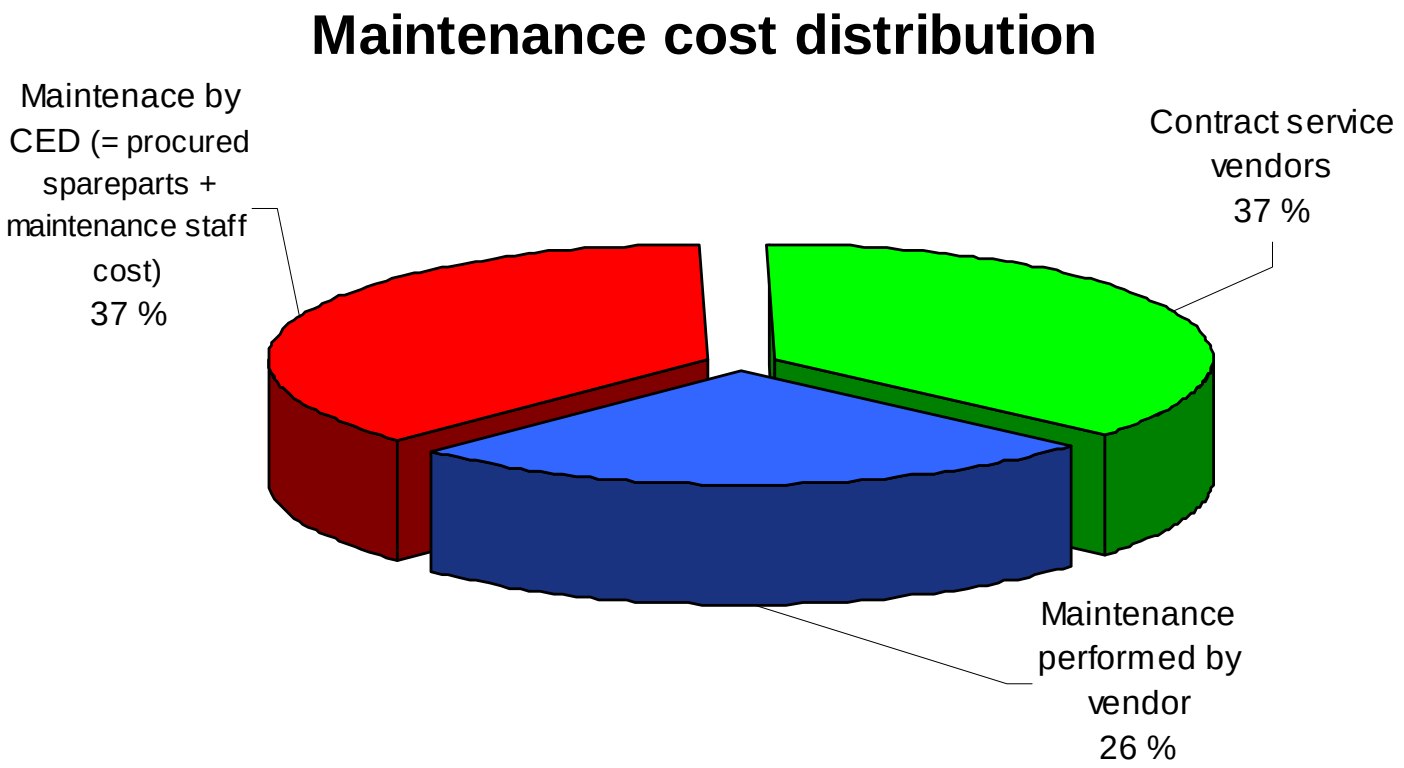
Service category	Man-years	%l
Staff and administrative functions	12,2	14 %
Service and maintenance of equipment	52,5	61 %
Fine-mechanical workshop	4,0	5 %
R & D	2,4	3 %
Education and user support	2,8	3 %
Planning, procurement and disposal	6,1	7 %
Inventory register	1,7	2 %
Common equipment pool	0,5	1 %
ICT-related MD	3,3	4 %
Other	0,0	0 %
SUM:	**85,5**	**100 %**

Results - 3

Distribution of cost per main service category multi-center total



Results - 4


Maintenance cost distribution
Maintenace by CED (= procured spareparts + maintenance staff cost) 37 %
Contract service vendors 37 %
Maintenance performed by vendor 26 %

Comparison: airline industry

Relevant Airline industry (approximate data values)	**Norwegian (2005)**	**SAS (2002)**	**Braathens (2002)**
Maintenance cost (services and people):	300 MNOK	5 500 MSEK	500 MNOK
Acc. Procurement cost airplanes	3 000 MNOK	45 000 MSEK	5 200 MNOK
Main Indicator	10 %	12 %	10 %

Inhouse vs. external service

Market cost for service from external vendors are typically much higher than internal cost. In Norway, the cost of an external service engineer is typ. 1.100 – 1.700 NOK/hour incl VAT, and travel time is typ. charged the same.

A basis for comparison with our internal cost in the hospital:

A mean norwegian engineer salary of 450.000 NOK (all employer costs included, pension etc), 900 invoicable hours during the year (i.e. approx. 50 % invoicable time, time utilised on actual maintenance) gives a basic cost of approx. 500 NOK/hour plus 40 % estimated overhead totals approx. 700 NOK/hour. The cost of internal labour is thus about ½ the price of a typical external supplier or vendor.

Cost of total subcontracted PM by vendor divided by the equipment value typ. approx. 10%

A recent Swedish comparison (2002)*: 20 bill SEK tot. MD value in Sweden, typ. level of service cost is 5 – 10%

* Stefan Olsson. Prioriteringsmodell för forebyggande underhåll av medicinteknisk utrustning. Department of Biomedical engineering. Lund University 2002. ISSN 1104-5841.

International data

After performing our first benchmark published in 2002, we became aware of a previous study published in 1990, made by Frize in cooperation with IFMBE (International Federation for Medical and Biological Engineering): **A majority of studied teaching hospitals around the world spend 3 – 5% of equipment value in the CED budget. In Nordic countries no hospitals spend more, and only 17% spend less.** (A summary is presented in Bronzino). This correlates well with our findings.

References

Frize M. ”Results of an International survey of Clinical Engineering departments. Part II: Budgets, Staffing, Resources and Financial Strategies”, Med. Biol. Engin. Comput., 28:160-165, 1990.

Bronzino J D (ed.). ”Management of Medical Technology. A Primer for Clinical Engineers”. ISBN 0-7506-9252-9, Butterwoth-Heinemann 1992.

Conclusions

- There are just minor differences in the main indicator results from the survey published 2002 (4,0 %) and 2006 (4,2 %). This variation is probably within errors of categorisation. There are suprisingly small differences between large and small hospitals.
- This is demonstrated a low cost compared to for instance the airline industry, which to an extent is comparable in regulations and safety to medical devices.
- In-house service cost less than contract service from outside vendors, and there is an argument for in-sourcing rather than out-sourcing.
- The findings correspond remarkably well with the previously published data from Frize in 1990.

The paper will be available at our web-site under an english entry-point:

www.med-tek.no

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