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Healthcare Message Standards -Who Benefits?

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Abstract. This paper considers the potential benefits of healthcare message standards of the sort developed by CEN/TC 251 WG3. Message standards are needed to cope with the complexity of healthcare information flows between clinical services, patient administration, diagnostic and therapeutic services, financial and other services, purchasing agencies and GPs. Timely computer-readable messages may improve the quality and efficiency of care. Standards reduce the number and costs of interfaces and enable forward compatibility of systems, while stimulating competition. An important side benefit is the quality of systems analysis now in the public domain.

1. What has been done

CEN/TC 251 WG3 has now produced eight standards and technical reports, and 36 standard messages. These deliverables fall into two categories covering generic and business purpose-specific issues:

1.1 Generic Issues

- Investigation of syntaxes for existing interchange formats to be used in healthcare (CR 1350:1993)
- Health information interchange - registration of coding schemes (ENV 1068:1993)
- Recording data sets used for information interchange in healthcare
- Methodology for the development of healthcare messages

1.2 Business Purpose-Specific

- Messages for the exchange of laboratory information (ENV 1613:1995) - 6 messages
- Request and report messages for diagnostic services - 8 messages
- Messages for patient referral and discharge - 8 messages
- Messages for exchange of healthcare administrative information - 14 messages

Those items with a CR (CEN technical report) or an ENV (European pre-standard) number were balloted by the European national standards organisations in the year stated. It is expected that all the remaining items will be balloted during 1996, bringing this phase of the work to a close.

The next phase of WG3's work programme covers the following work items, now starting:

- Messages for the exchange of information on drug prescription
- Request and report messages for blood transfusion services
- Messages for the exchange of patient medical record information

- Messages for the exchange of information on authorisation and reimbursement
- Messages for adverse drug reactions
- Maintenance of message standards
- Messages for maintenance of supporting information in healthcare systems.

2. The Need for Standards

Using the analogy of a railway network, standards are needed at three main levels (NB the OSI model has seven levels, within our level 1):

1. Network - the track and signalling. This must ensure the safe delivery of whatever is carried. The computer industry has now adopted *de facto* standards for networking which fully meet the present needs of health services.
2. Messages - analogous to the trains, which carry things across the network. Standards such as UN/EDIFACT (ISO 9735) specify the syntactical structure of messages and how they should be addressed. These are not healthcare-specific.
3. Contents of messages - analogous to the content of the parcels sent. These standards need to be specific to the business purpose, in this case healthcare. The precise meaning of each message must be unambiguously represented, so that it is understandable and useful to the receiver.

Maintaining the railway analogy, both sender and receiver must use the standards and protocols precisely as specified, even though this may involve some changes to previous practice. Trains only stop at stations, containers must be of an agreed size, and delivery addresses must be appropriately specified.

3. Healthcare Information Flow

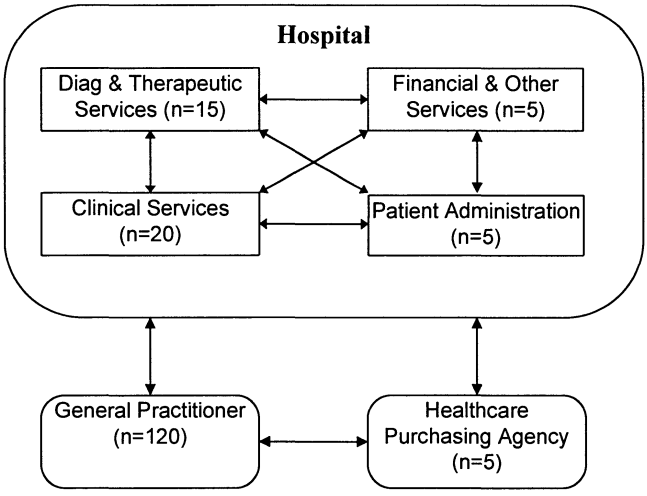
Communication patterns in healthcare are complex, involving numerous people over a wide geographical area and covering a highly diverse range of subject matter. Each GP refers patients to many specialists, and each specialist receives referrals from many GPs. Every doctor communicates with a large number of diagnostic and therapeutic services, community care agencies, administrative and funding bodies.

The diagram below is a simplified representation of healthcare information flow. Six parties are identified:

- Diagnostic and therapeutic services, covering clinical laboratories, diagnostic imaging, pharmacy, radiotherapy, dietetics, physiotherapy etc. Each acute hospital has at least a dozen such departments, which provide diagnostic and therapeutic services to clinical units within the hospital and (usually) to GPs. A high proportion of clinical laboratories are now computerised. Indeed most modern diagnostic equipment depends on internal computers.
- Clinical services cover the main secondary care providers, such as the medical and surgical specialists and their immediate teams. The clinical services work in out-patient clinics, on wards (for in-patients and day-cases) and in operating theatres. Each acute hospital has dozens of specialists (consultants), who may work in administrative groupings known as clinical directorates. This group is the most important single group, because it is the decisions made by hospital specialists that determine what is done for each patient, and hence both the outcome and the cost

of care. Remarkably few hospital doctors (less than 2%) are yet provided with computers for use in their consulting rooms.

- Patient administration covers all of the administrative functions of a hospital such as patient registration, clinic appointments, admission arrangements (including waiting list management), bed state and routine hospital statistics. Most hospitals have computerised these functions.
- Financial and other services cover the traditional business services such as billing and sales ledger, buying and purchase ledger, general ledger, pay-roll, personnel and asset management. These functions are widely computerised.
- General practitioners act as the gate-keeper to the hospitals in many European countries. In the UK and the Netherlands most GP (about 80%) are computerised, and many run "paperless" practices.
- Most healthcare payment agencies (such as insurance companies and the FHSAs in the UK) are highly computerised.



This brief description highlights the extraordinary failure to computerise hospital clinical services, which has been attributed to many causes, including: (1) the existence of operational demonstrators; (2) leadership from the medical profession; (3) government support, encouragement and financing; (4) problems related to accessibility of data; (5) worries about security and confidentiality; (6) availability of adequate clinical codes; (7) the lack of standard communications interfaces; and (8) advances in computer technology.

In this paper we address only item (7) on this list, the need for standard communications interfaces. Hospital specialists are unique in being so dependent on information which is generated outside their immediate control, by a wide range of services. The full benefits of computers will only be realised when all of the information needed by hospital specialists is made available to them electronically.

4. Quality of Care

Health information networks, such as local hospital networks and wide area networks, such as the NHS-wide Network, offer major potential benefits in terms of improved patient care - by assisting quicker and more soundly based decision-making, and reduced labour costs by eliminating unnecessary replication of work and the time delays involved in paper-based systems.

The benefits of using standards may be classified according to the group which stands to benefit:

- Patients, who receive quicker and more soundly-based care
- Hospital doctors, having access to information when and where they need it
- GPs and community nurses, improved communication with hospitals, laboratories and imaging departments
- Contracts and billing, to obtain quicker authorisation of treatment and payment
- Senior management and contract negotiators, better understanding of workload and costs, and so can negotiate more advantageous contracts.

5. Efficiency of Care

Clinical and administrative staff should spend less time on clerical chores such as:

- re-entering information into computers
- looking for notes, investigation reports and letters
- collecting and coding information for statistical and audit purposes
- finding answers to queries from patients, GPs and community staff.

Difficulties in finding the information needed cause major frustrations in out-patient clinics to receptionists, nurses, consultants and registrars; on wards to ward clerks, nurses, house officers preparing for ward rounds and SHOs preparing discharge summaries; and in offices answering queries and handling complaints.

6. Number and cost of Interfaces

The number of interfaces required rises as the square of the number of systems to be connected, if all interfaces are bespoke. While a single interface between two applications may be cost justified, the costs of interconnecting ten or twenty systems becomes prohibitive. However, standards provide a solution to this problem. If a system complies fully with a standard, it should be able to exchange data with other systems which also comply with that standard.

Bespoke interfaces are expensive to develop, test and maintain. Standards promise to reduce all of these costs. Much of the **development** cost of any new interface can be attributed to the difficulty of analyst/programmers obtaining a full and adequate understanding of the remote system with which they are seeking to interface, and the network over which the communication will take place. This understanding must include its performance under a wide range of error conditions and failures, and full knowledge of all codes used.

Testing can present considerable problems. Few users want testing to be done on a live system, so tests are normally done using atypical test data and configurations. Few remote systems can provide a comprehensive set of test data to test all probable circumstances.

Maintenance presents big problems in interfaces, unless great care has been taken. A minor upgrade to the remote application or to some part of the network can mean that the interface ceases to function properly. If the remote user is not directly to blame (because the modification was provided by an independent third party), they will first blame the interface supplier.

7. Forward Compatibility

Obsolescence is every IT manager's nightmare. The rate of technical progress is such that no-one can safely predict the future. Even two years ago, how many predicted that the WWW and HTML would be what they are today. Standards offer the best guarantee for future migration, growth and evolution paths for your systems. They also can help avoid the problem of becoming locked into a single monopoly supplier. Standards based on object technology are likely to be able to evolve by using the properties of inheritance and polymorphism. The next generation of standard can inherit all of the properties of the old (inheritance), while backward compatibility is achieved using polymorphism (the ability of an object to take on more than one guise).

European message standards have adopted many of the concepts of the object oriented approach. One of these is the separation of the logical model of a system from the implementation model. The logical model is independent of the environment in which it is to be implemented, while the implementation model is necessarily constrained by the environment within which it is to be implemented. The logical model is quite stable, and will not need changing if, for example, the hardware platform or operating system facilities used in a particular implementation should change. This means that the standards are applicable to both large and small implementations.

The same logical model may prove to be appropriate in very different architectures. For instance, the architecture of a store and forward messaging system is quite different from that of an interactive system where systems inter-work. However, many details of the logical model may remain the same, although the implementations may be rather different.

8. Systems Analysis

Paradoxically, one of the most important benefits of message standards is likely to be an improvement in the design and functionality of the systems which send and receive these messages. Health care is an enormously complex business, and the quality of systems design ultimately depends on the quality of the systems analysis which feeds it. The systems analysis performed by the healthcare message standards project teams is of a high standard. There is little or no comparable, internationally validated work available in the public domain.

The European message standards represent a genuine international consensus, involving the active participation of experts from a dozen countries, including the US. The message development work is normally done by an international project team, recruited using an call for experts, to include the leading experts available.

The fact that healthcare message standards inevitably involve heterogeneous applications, designed for very different purposes, means that these standards will

have a wide impact across all types of applications which are affected, leading inevitably towards consensus and conformity. In the short term this will result in a general improvement all round but, in the medium to long term, these standards may limit the rate of evolution and progress.

9. Competitive Market

One of the fundamental pillars of the European Union is the idea of free and open competition, especially in all areas of public procurement. Standards are a critical aspect of this policy. For instance EEC Decision 87/95 explicitly requires all public sector bodies to procure to agreed international standards. In the NHS, all procurement has to use a special questionnaire to specify which standards are required, and which are not. This procedure is known as STEP (Standards Enforcement in Procurement).

The use of standards increases the level of choice open to purchasers, allowing them to compare solutions offered by different suppliers with the security that if each supplier guarantees conformance to specified standards, they will be legally liable if they fail to deliver on these aspects. Purchasers can concentrate their attention on choosing the supplier who is best able to meet their central business requirement.

Further Information:

http://www.imc.exec.nhs.uk:8000/tc251/wg3/