

13th PCS/E INTERNATIONAL WORKING CONFERENCE

Florence, Italy, 1 - 3 October 1997

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FEEDBACK AND AUDIT: INGREDIENTS FOR QUALITY IMPROVEMENT

Summary

Feedback and evaluation are well known principles of organisational development and quality management. The objective of this paper is to present the work done and in progress in Portugal concerning the production of feedback reports of routinely produced DRG information, as well as the data auditing scheme established at all National Health Service hospitals. Feedback reports are disseminated to the hospitals since 1993 and include three sets of information: performance measures, quality of care alerts and data quality assessment. A hospital-wide framework for data evaluation was put in place in 1995, whereby internal and external audits are carried out on a regular basis, resulting in the development of a measurement tool that embodies three dimensions: coding, questionable admissions and accomplishment of rules and time frames. The results of these activities are illustrated by the comparative analysis of a large teaching hospital with its peer group, together with a discussion of current strengths and limitations.

Introduction

The health care context in Portugal is not different from that of other developed economies which face the pressure to control ever increasing costs. The search for solutions creates a critical need for communication between actors, requiring that everyone speaks and understands a common language. The use of case-mix classification systems, like the DRGs, provides useful tools towards that end. DRGs give managers a critical appreciation of the complexity of the issues associated with clinical management, while clinicians become more prepared to understand the financial constraints that managers have to face. DRGs help find differences in outcome, quality and cost of care, creating opportunities for improving hospital cost-effectiveness.

DRGs were introduced in Portugal in 1984, aimed at the development and implementation of a fully integrated information system for the management and financing of hospitals. Since 1990 DRGs have been used to adjust hospital budgets for the National Health Service (NHS) and for payments to NHS hospitals from third party payors (Kimberly et al., 1993; Bentes et al., 1996 - 1; Bentes et al, 1997).

The management information required to operate the DRG system in Portugal has generated benefits beyond financing. The available information makes evaluation of hospital performance possible on a routine basis, enabling managers and physicians to be informed about national practices and to monitor individual deviations from observed standards. As Keehley and McBride (1997) point out, the improvements in quality and efficiency obtained by industry through best practices and benchmarking have been so profound and widespread, that the health sector is waking up to the benefits of this powerful analytical tool. In this respect, a study conducted by Evens et al. (1995) showed that physicians respond positively to information provided by performance measures. It was found that physician profiling in US hospitals, where a physician resource consumption is compared with a benchmark figure does, significantly increase the percentage of physicians who achieve the length of stay benchmark.

Although these results refer specifically to the effect of profiling on physician's behaviour, it is reasonable to expect the same type of effect at the institutional level. First, physicians are the major responsables for resource allocation, therefore changes in their consumption profiles impact directly on hospital cost-effectiveness. Second, hospitals are open systems and as such, are information dependent. According to Charles Austin (1979), hospitals exchange energies and information with their environment and are influenced by and influence the environment in which they operate. In particular, hospitals are influenced by social factors which affect professional and patient behaviour and the patterns of utilisation of services. Thus, to the extent that peer comparisons impact on reputation, the use of benchmarking information will help individual hospitals improve their performance.

The purpose of benchmarking is to identify variability in performance and reduce it by adopting "optimised" processes. Variability is a natural result from any complex production process, where patient care is obviously included. Therefore, to make sound decisions when analysing outcome data, managers need to distinguish common and special cause variation (Plsek, 1992). The statistical process control techniques largely adopted in industry, using control charts, provide valid tools towards that end. The basic concept, as described by Shewhart and further refined by Deming and Juran, is that the limits of non-significant fluctuations in any production process can be established and the outputs monitored. Processes whose outputs remain within the control limits are considered to be under control and can be allowed to continue. Processes whose outputs transgress the control limits are considered to be out of statistical control and adjustments are needed to return the process to control (Decker, 1992).

As must be the case for any new patient classification system, the DRG system in Portugal was initially based on information which was incomplete and which contained errors of unknown type and magnitude. In response to this serious problem, the financing system included features which were intended to minimise the impact of these errors (short stay outlier payments, blended hospital rates, etc. (Bentes et al., 1993)). As expected, the completeness and accuracy of the data was improved over time though still remains short of perfection. To ensure a continuous improvement in data quality, controls need to be put in place and that means the set up of auditing schemes.

The objective of this paper is to present the work done and in progress concerning the production of feedback reports of routinely produced DRG information, as well as the data auditing scheme established at all National Health Service (NHS) hospitals. Results are

illustrated by the comparative analysis of a large teaching hospital with its peer group, together with a discussion of current strengths and limitations.

Data and Methods

Patient demographic and clinical data are routinely collected at all acute NHS hospitals according to an uniform hospital discharge summary (UHDS) and using a standardised data collection process which uses ICD-9-CM to code diagnoses and procedures. These data, which are primarily aimed at assigning the appropriate DRG (HCFA 10.0) to each discharge, are forwarded to IGIF (a central department at the Ministry of Health) where a set of national and hospital peer group indicators are generated. The national DRG database includes about 800.000 yearly cases. In addition, hospitals are classified in five peer groups. These groups reflect differences in cost structures and in case-mix largely associated with different roles played by those hospitals in delivering health care (Bentes et al., 1992). The use of groups for statistical analyses ensures that only hospitals with similar cost and case-mix potentials are compared to each other, thus augmenting the significance of reference values generated within the groups.

Since 1993, periodic feedback reports containing case-mix adjusted performance and quality indicators are prepared and disseminated to the individual hospitals providing "benchmark" measures that can be used to assess performance, identify potential quality problems, and improve utilisation review activities. The benchmarks are practice-based rather than standard-based, in the sense that they reflect observed national and peer group averages instead of "best" results. Nevertheless, hospital patterns in respect to the selected indicators can be established and monitored, enabling clinical reviews of individual cases to be targeted to areas with major deviations from the reference values, thus providing a more cost-effective use of resources.

Hospital feedback reports are composed by three sets of information: performance measures; quality of care alerts; and data quality evaluation.

Performance measures

Performance measures include inpatient volume and length of stay (LOS) by DRG and case-mix evolution. Hospital expected overall average length of stay (ALOS) is also presented not only because LOS is an important resource control variable but also it is easily available and results are readily interpreted. The expected ALOS corresponds to the global length of stay that the hospital would have, if the average length of stay for each of its DRGs was the same as the observed LOS for the DRGs of the peer group. Having the expected overall ALOS as a reference, the hospital can easily identify deviations to its global ALOS.

The identification of DRG trim points to ascertain the DRG "normality range" of LOS is a good example of the use of control charts to monitor results. A low and a high trim point are computed for each DRG, at a national level, using a modified version of the inter-quartile range of the inpatient LOS distribution. These standard trim points are then used to identify "outliers" - patients in the DRG whose LOS is significantly different than the DRG ALOS. Since DRGs define patients who are expected to be treated similarly at the hospital, these deviations suggest that problems might be occurring with those patients that deserve further analyses.

Quality of care alerts

Quality of care can be generally defined as the gap between expected and actual outcomes for a group of similar patients. In order to obtain some measure of the hospital's level of quality of care, specific indicators need to be identified which have a fairly clear connection with positive or negative patient health status. However, its interpretation should be careful, considering that each hospital has its own reality which may influence the meaning of the results.

The following quality alerts are reported to the hospitals:

1) Percentage of readmissions on surgical DRGs

A readmission has been considered as any inpatient episode of care subsequent to another episode classified into a surgical DRG (first episode DRG), occurred in a period of time within 30 days. This definition excludes the cases where the second episode of care is grouped in one of the following DRGs, since repetitive admissions are expected for clinical reasons: DRG 249: Aftercare, musculoskeletal system and connective tissue; DRG 317: Admit for renal dialysis; DRG 409: Radiotherapy; DRG 410: Chemotherapy without acute leukemia as secondary diagnosis; DRG 492: Chemotherapy with acute leukemia as secondary diagnosis; DRG 465: Aftercare with history of malignancy as secondary diagnosis; and DRG 466: Aftercare without history of malignancy as secondary diagnosis.

Although readmissions of individual cases do not have, by themselves, any particular meaning, a hospital with deficient quality care will present, eventually, a percentage of readmissions higher than its peer group values. The percentage of readmissions provides the means for targeting areas that should be looked more carefully. For example, if hospital readmission levels are acceptable except in a specific set of DRGs, the problem is likely to be associated with the clinical service providing the DRG services. However, if hospital performance is poor on all surgical DRGs, causes should be looked for in a more systemic way, for instance, in the working conditions of the theatre or in the lack of a hospital policy to control infections.

2) Mortality in selected DRGs

Even though mortality is a crude indicator of the quality of care (death as a result does not, necessarily, indicate process deficiencies), it is relevant as a statistical outcome indicator when adjusted by patients age and characteristics. One should not lose sight of the fact reported by Dubois and Brook (1988) that about one fourth of in-hospital deaths from some diseases could be prevented. In addition, mortality, as a statistical indicator, presents two desirable characteristics. First, the definition of death is objective; second there is no expected variation in the collection of in-hospital deaths.

DRGs which reflect certain conditions and procedures have been selected¹ for mortality analysis. Patients were divided by age groups (patients below or equal to 65 years old and patients above 65 years old) to enable a more relevant interpretation of the results.

¹ DRG 14: Specific cerebrovascular disorders except TIA; DRG 27: Traumatic stupor & coma, coma >1 hr; DRG 87: Pulmonary edema & respiratory failure; DRGs 89- 90: Simple pneumonia & pleurisy, age >17; DRG 91: Simple pneumonia & pleurisy age 0 - 17; DRGs 121 - 123: Circulatory disorders with AMI; DRG 127: Heart failure & shock; DRG 148: Major small & large bowel procedures with CC.

3) Complications related with surgical procedures/Complications related with pregnancy, delivery and puerperium/ Decubitus ulcer as secondary diagnosis

Complications occurred during the hospital stay, by their implications on patient well-being and recovery, are powerful outcome indicators. In spite of the fact that some complications cannot be avoided, it is known that the occurrence of a high number of specific diagnoses by themselves or combined with others is associated to deficient quality of care in hospitals.

Thus, a set of ICD-9-CM codes were identified for hospital feedback reporting and were grouped in three areas: surgical procedures; obstetrics and newborns; and nursing care. The first area includes post-operative infection, operatory wound dehiscence, accidental lacerations, post-operative haemorrhage; the second one, perineal lacerations of 2nd, 3rd and 4th degree on vaginal deliveries, new-born trauma and asphyxiation; and the final one, the presence of decubitus ulcer as secondary diagnosis.

It should be noted that the existence of these diagnosis do not provide evidence about the quality of care in individual cases or even in small samples. However, when the incidence of these secondary diagnoses is analysed for large group of patients, it can be expected that deviations to reference values, might indicate potential quality problems.

Quality of data evaluation

The good quality of the data is a prerequisite to its use, besides being an essential element to ensure health care quality. The correct and complete filling of medical records and the adequate administrative proceedings are also important to compare hospital's performance. Therefore, as a major priority, the establishment of a hospital-wide framework for data evaluation was put in place.

Internal and external hospital audits are carried on a regular basis, since 1995. Each hospital has assigned an internal auditor who coordinates the data collection process and supervises the clinical coding ensured by the group of in-hospital physician coders. An external auditing team, composed by eight specialised physicians and a senior manager from IGIF, has been appointed to promote, support and monitor audit activity at the hospitals, thus complementing the ongoing internal audits.

Audits are supported by a software which identifies the main data errors and inconsistencies, on samples of hospital records. This software returns information about the average number of codes per record, the percentage of invalid codes for diagnoses, procedures and administrative data, coding errors (opposite codes for instance) and alerts to eventual coding problems or deficient information in the medical records (diagnosis and procedures duplication, unspecified principal diagnosis, questionable admissions, unacceptable principal diagnosis, unspecified operating room procedures, operating room procedures unrelated to principal diagnosis, lack of external causes of injury and poisoning, records without procedures) and atypical lengths of stay.

The analysis of representative samples of hospital records enabled the identification of the main problems at national level. An evaluation table was then filled based on explicit criteria that embodies three dimensions: coding, questionable admissions and the accomplishment of the established rules and time frames for data collection and forwarding to IGIF. Each criterion is scored in a numeric scale and the final result for the hospital is a weighted average of the

scores obtained in each dimension. The evaluation table and scores are presented in attachment.

It is worth noting that as part of the financing criteria for 1998, the final score of the individual hospitals has been considered for adjustments to the preliminary budget , in terms of premiums/penalties, thus creating additional incentives to data quality improvement.

Results and discussion

As noted earlier, feedback information that is currently reported, will be illustrated by the results of a large (1.500 beds) teaching hospital - Hospital X. The intention is not to assess the impact of this process on the hospitals' behaviour but rather to show the information resources that are currently available both to the hospitals and to IGIF.

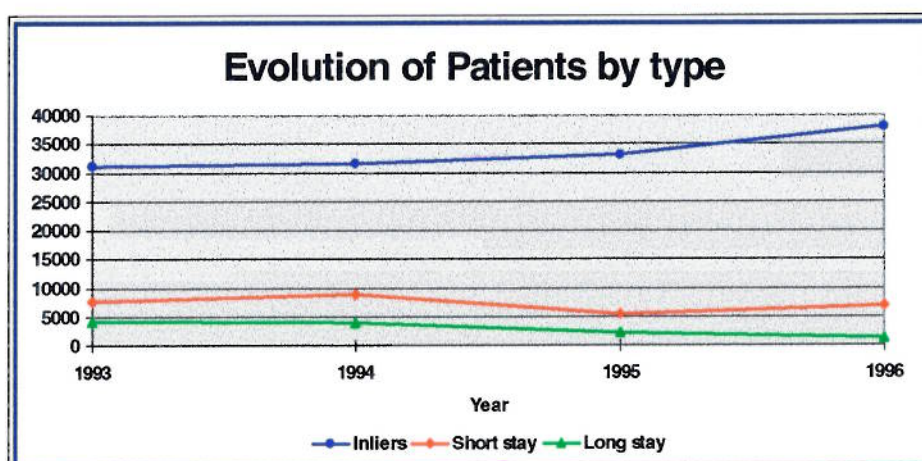
In general, data pertaining to the individual hospitals are presented in terms of evolution in the last four years or comparisons with either the group or national mean values which are used as practice-based references.

I) Performance measures

Figure 1 shows an example of the first situation, where a graph has been used to present the evolution of volume by type of patient, in the last four years, for Hospital X. The number of inlier discharges increased about 22%, while the number of long stay cases declined and the count of short stay cases shows a fluctuating pattern.

Figure 1

Hospital X



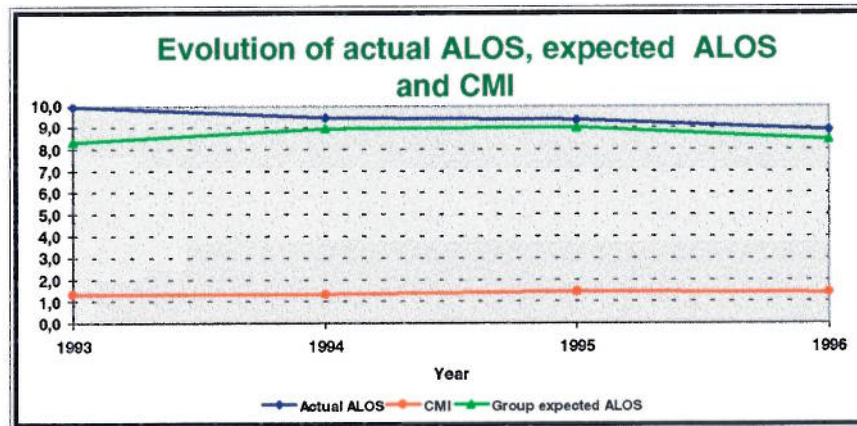
Source: IGIF/DDSFG, 1997

Figure 2 offers a similar evolution, this time focusing on LOS and case-mix. As can be observed, case-mix complexity slightly augmented, eventually reflecting both improvements in coding and an increase in the complexity of cases. As treating more complex cases is expected

to enlarge LOS, the observed decline in overall ALOS may be more significant than it initially appears to be. However, actual hospital ALOS is higher than expected ALOS, meaning that even controlling for case-mix changes, efficiency can still be improved.

Figure 2

Hospital X

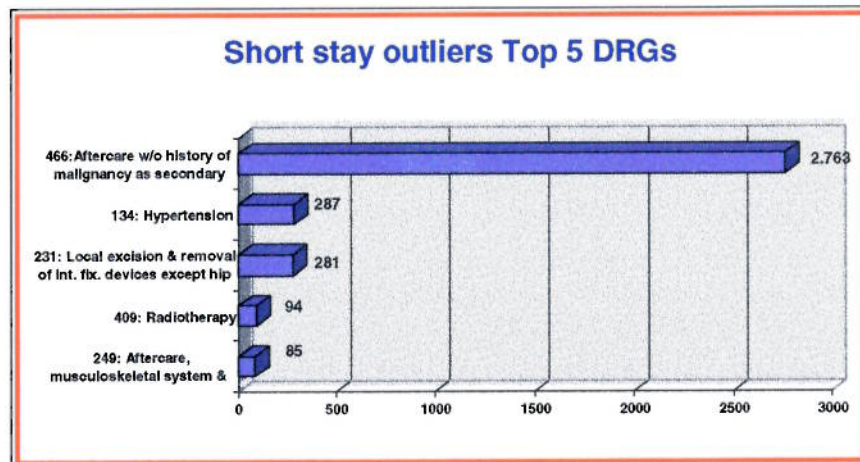


Source: IGIF/DDSFG, 1997

The increase in patient volume and the decrease in ALOS are expected results to the extent that one of the major incentives of DRG based funding is to treat more cases and to treat them as efficiently as possible. One preliminary study (Dismuke, 1995) on Portuguese hospitals found that unadjusted LOS declined for the five most frequent non-obstetric DRGs between 1992 and 1994.

Figures 3 and 4 display the five DRGs with the larger number of short and long outlier cases. The intention is to help the hospital target its quality assurance and utilisation review activities to areas where problems are more likely to occur. This process has been initiated in Portugal (Bentes et al., 1993; Bentes et al., 1994) but much work remains to be done. Outliers suggest that a problem exists but will not indicate which problem and, particularly will not tell what action should be taken to solve it. This can only be done through revision of individual cases to determine the assignable cause for the variance, i.e., unusual clinical situations, social or physical problems which prevent early discharge or different physician practice. The ultimate goal should be to improve the process of care within the hospital so that the identified problem does not re-occur.

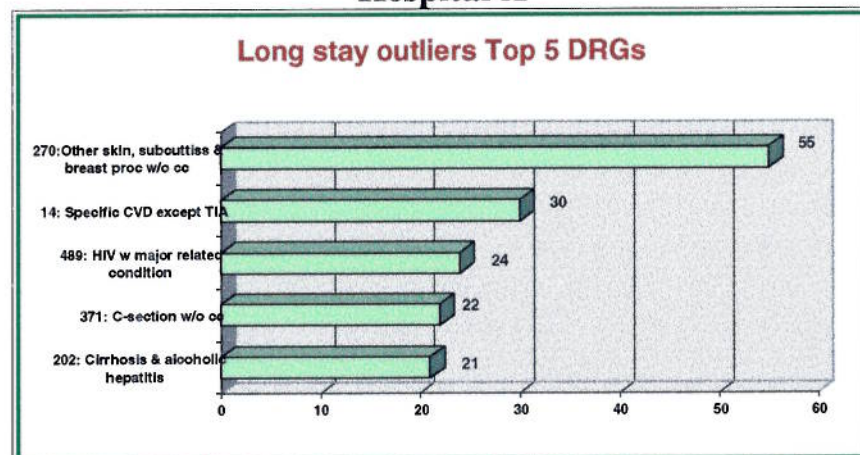
Figure 3
Hospital X



Data: 1996

Source: IGIF/DDSG, 1997

Figure 4
Hospital X



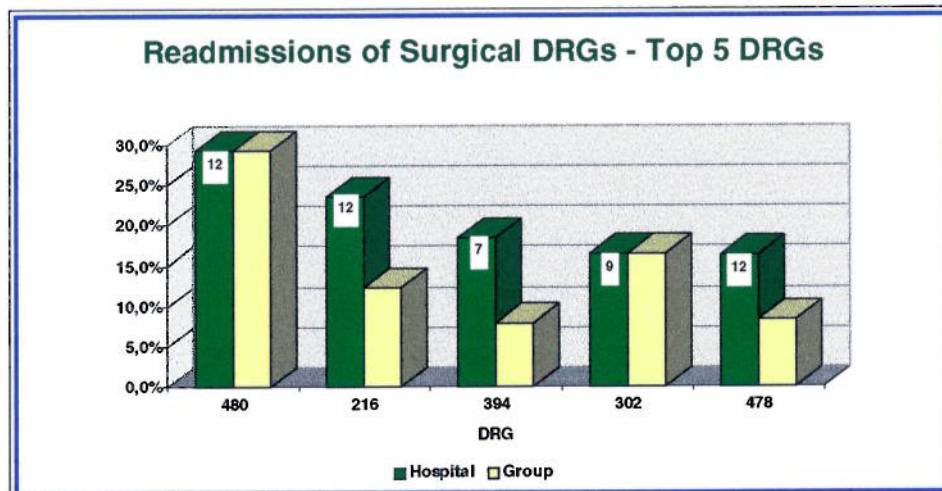
Data: 1996

Source: IGIF/DDSG, 1997

II - Quality of care alerts

Figure 5 compares the percentage of readmissions for surgical cases between Hospital X and its peer group for the five DRGs with higher readmissions at the hospital. For each DRG, the actual number of readmissions is displayed for a better assessment of volume. The sensitivity and specificity of readmission rates as an indicator of quality is generally clouded by difficulties in accessing the clinical relationship to the previous inpatient episode on a routine basis. Thus, the results are not self-explainable and further investigation will have to be done at the hospital.

Figure 5
Hospital X



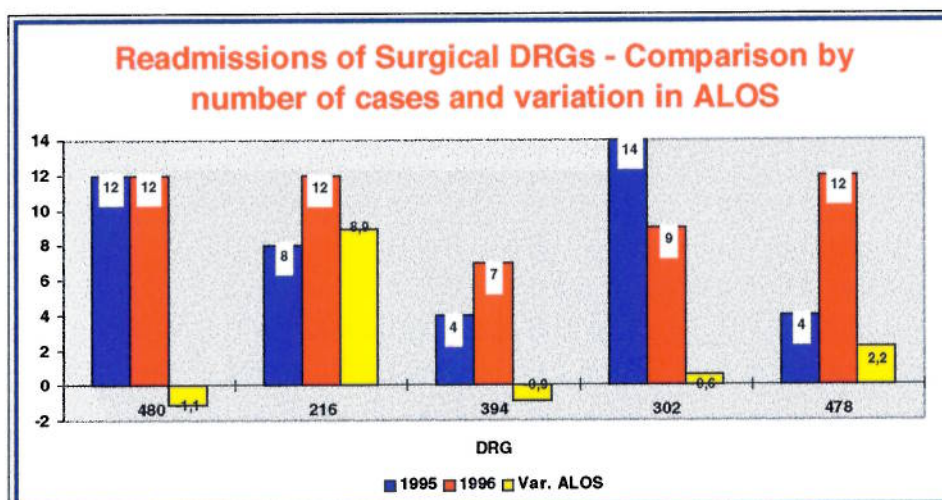
Note: DRG 480: Liver transplant; DRG 216: Biopsies of musculoskeletal system and connective tissue; DRG 394: Other O.R. procedures of the blood and blood forming organs; DRG 302: Kidney transplant; DRG 478: Other vascular procedures with CC.

Data: 1996

Source: IGIE/DDSFG, 1997

One might expect readmissions and length of stay to be related due to the effect of premature discharge. **Figure 6** compares the variation of readmission rates and length of stay for the selected DRGs. The results for Hospital X do not suggest this pattern. Except for DRG 394, where a decrease in ALOS is accompanied by an increase in the number of readmissions, there seems to be no association between the two variables.

Figure 6
Hospital X



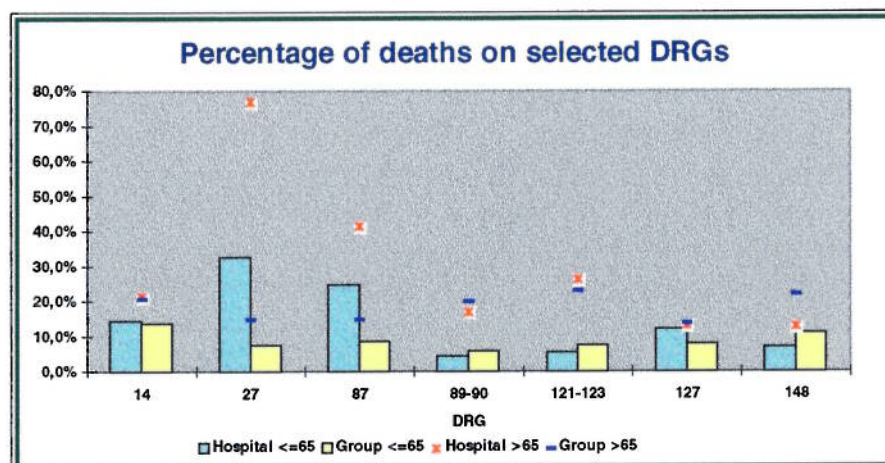
Note: DRG 302: Kidney transplant; DRG 480: Liver transplant; DRG 482: Tracheostomy w mouth, larynx or pharynx disorder; DRG 304: Kidney,

ureter & major bladder procedures for non-neopl. w CC; DRG 461: O.R procedure w diagnoses of other contact w health services.
Source: IGIF/DDSFG, 1997

Mortality is also reported for selected DRGs, comparing the hospital with the group (Figure 7). To illustrate age adjusted mortality, the histogram has been overprinted to point out eventual differences, between age groups. One must be aware that age adjusted mortality provides a very crude measure of hospital outcome. To improve the use of mortality as an indicator of quality, further adjustments for patient (sex, severity of illness) and hospital characteristics (number of beds, available technology, teaching status) should be considered when computing the reference values. But one should not lose sight of the fact that, being the hospital's mission clearly related to avoiding or delaying death, hospitals should not jeopardise the opportunity to find some signals in mortality data, even if currently available indicators are far from perfection.

Figure 7

Hospital X



Note: DRG 14: Specific cerebrovascular disorders except TIA; DRG 27: Traumatic stupor & coma, coma >1 hr; DRG 87: Pulmonary edema & respiratory failure; DRGs 89-90: Simple pneumonia & pleurisy, age>17; DRGs 121-123: Circulatory disorders with AMI; DRG 127: Heart failure & shock; DRG 148: Major small & large bowel procedures with CC.

Data: 1996

Source: IGIF/DDSFG, 1997

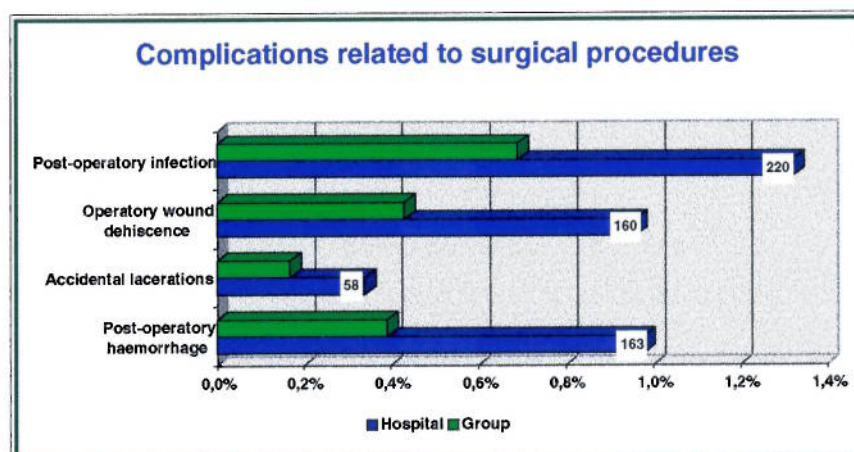
Figure 8 and **9** present comparative analysis of several dimensions of the hospital's complication rate.

In spite of the relatively low percentages of post-operative complications, Hospital X reports in all indicators higher levels than its peer group. Despite the fact that more accurate coding is expected to be associated with higher severity, the number of adverse outcomes reported by the hospital (having from 58 accidental lacerations to 220 post-operative infections) should call the attention for the "zero defect goal" of quality management principles. There should not be

a minimum level acceptable for post-operative complications. All surgeries should be free of defects.

Figure 8

Hospital X



Data: 1996

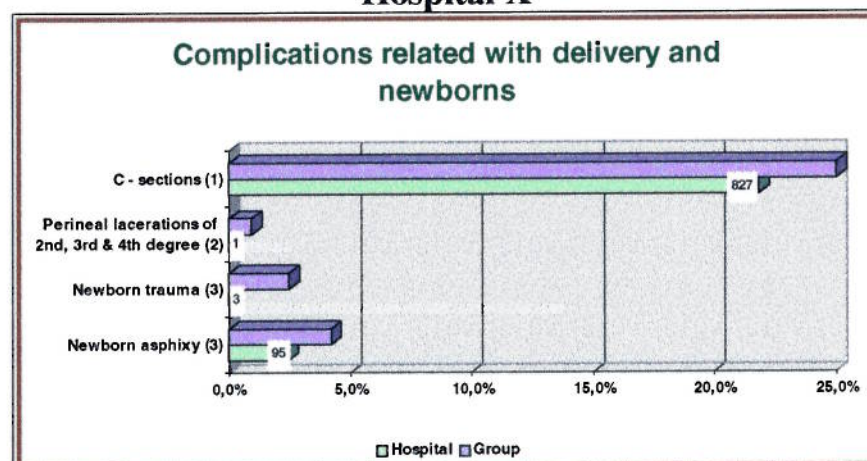
Source: IGIF/DDSFG, 1997

In respect to maternal and childbirth complications, **Figure 9** reports a rather favourable picture of Hospital X in comparison with the peer group.

These findings, especially in relation to the level of c-sections as a percentage of total deliveries are consistent with results of preliminary studies on Portuguese hospitals (Bentes et al, 1994) as well as empirical results reported in the literature (Leape, 1989), which point to the fact that regional clinical practice is an important explanatory factor for the observed variation in c-sections rates across the country.

Figure 9

Hospital X



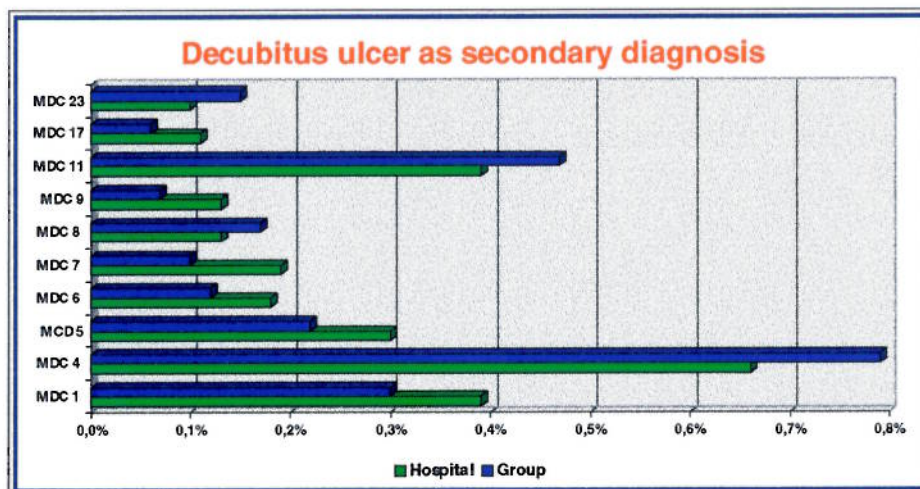
Data: 1996

Source: IGIF/DDSFG, 1997

Finally, **Figure 10** displays the comparison between Hospital X and the peer group, in respect to the percentage of decubitus ulcer as secondary diagnoses, by Major Diagnostic Category. The rationale for this type of aggregation is that the incidence of pressure ulcer must be seen in relation to the frequency with which certain groups of principal diagnoses and procedures are present at the Hospital.

Figure 10

Hospital X



Note: MDC 1: Diseases and disorders of the nervous system; MDC 4: Diseases and disorders of the respiratory system; MDC 5: Diseases and disorders of the circulatory system; MDC 6: Diseases and disorders of the digestive system; MDC 7: Diseases and disorders of the hepatobiliary system and pancreas; MDC 8: Diseases and disorders of the musculoskeletal system and connective tissue; MDC 9: Diseases and disorders of the skin, subcutaneous tissue and breast; MDC 11: Diseases and disorders of the kidney and urinary tract; MDC 17: Myeloproliferative diseases and disorders, and poorly differentiated neoplasms; MDC 23: Factors influencing the health status and other contacts with health services

Data: 1996

Source: IGIF/DDSFG, 1997

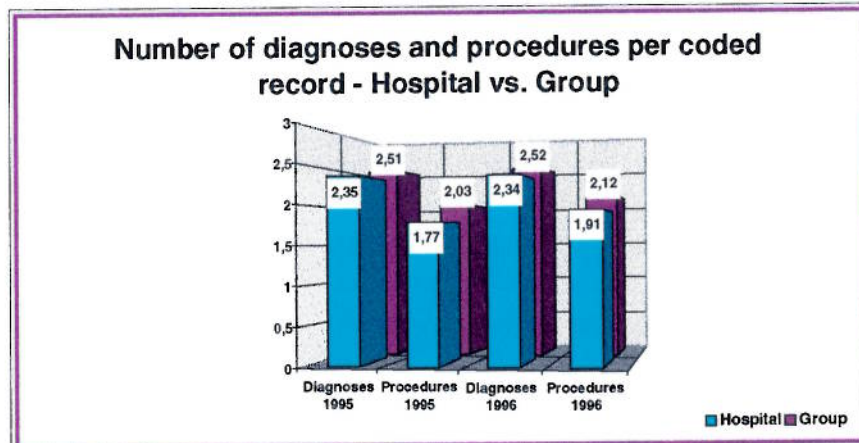
III - Quality of data evaluation

Figure 11 presents the comparison between Hospital X and the group, concerning the number of diagnoses and procedures per coded record. As can be observed both ratios are similar for diagnoses but in respect to procedures the hospital is still behind the group benchmark (1,91 vs. 2,12)

It should be noted, though, that while the number of diagnoses per record is stable, the ratio of procedures per record shows an increase both for the Hospital and for the group between 1995 and 1996. This is seen as a positive finding since more codes per record mean more information in the medical record and a more accurate description of the inpatients products (i.e. the DRGs).

Figure 11

Hospital X



Source: IGIF/DDSFG, 1997

Figure 12 displays the results obtained by the hospitals, in respect to data quality, where a scatter plot has been used to compare Hospital X final score with all the equivalent scores obtained by the other 86 hospitals. A high score on this scale indicates a low overall quality of the data.

As can be observed Hospital X obtained a global score of 0.3 being favourably positioned in the 64th percentile of the distribution.

Looking at the score obtained in the different items (**Table 1**), one gets a glimpse of the main data quality problem of Hospital X - extended inpatient stays without mention of complications/comorbidities and potential ambulatory care treated as inpatient stays.

Table 1

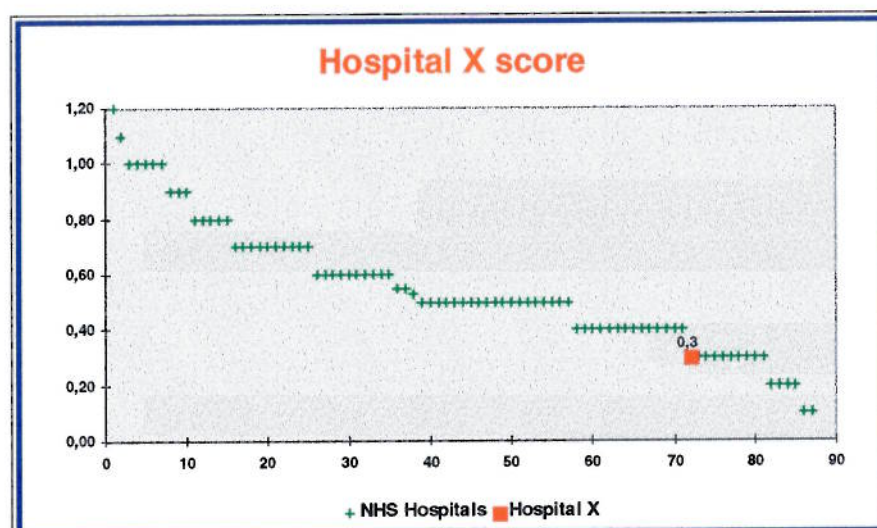
Data Quality Evaluation Table

Explicit Criteria	Hospital X score
CATEGORY A - Coding	
1) Transplant DRGs, incompatible with the hospital	0
2) Use of the E code	0
3) Unspecified Principal Diagnosis	0
4) Error DRGs (469, 470)	0
Score A	0
CATEGORY B - Questionable Inpatients	
5) Unacceptable Principal Diagnosis	0
6) Questionable Principal Diagnosis	0
7) Long inpatient stay without complications	2
8) Zero day stays (excludes DRGs eligible for Ambulatory Surgery)	1
Score B	0.75

CATEGORY C - Norms Accomplishment	
9) Delay in sending data to IGIF	0
10) Use of DRG v. 10	0
Score C	0
Final Score = $0,4A + 0,4B + 0,2C$	0.3

Figure 12

Hospital X



Data: 1996

Source: IGIF/DDSFG, 1997

Extended hospital stays due to conservative clinical management have been identified as a major problem in NHS hospitals, according to Utilisation Review studies conducted in Portugal during the period between 1990 and 1992 (Bentes et al., 1995). However, we must be aware of the fact that undercoding of secondary diagnoses (an average below one in Portugal compared to four in the U.S.A.) is also a relevant source of apparent inconsistencies between clinical status and length of stay.

The classification of ambulatory care as inpatient stays has also been identified as an important bias of the Portuguese DRG based funding system (Bentes et al., 1996 - 2). The recent definition of prices for ambulatory surgery in "eligible" DRGs, in the short run and the implementation of APGs (Ambulatory Patient Groups) in the long run are expected to be definite solutions for this problem.

Concluding remark

Feedback and evaluation are well known principles of organisational development and quality management.

In the context of the Portuguese DRG based funding system, performance and quality feedback reports and internal and external data auditing are tools that have been developed to help hospitals respond to the system's incentives while supporting IGIF in its payor role.

Feedback reports are currently far from perfect but they represent a starting point towards the production of meaningful case-mix adjusted benchmarks for the hospitals. Considerable work remains in terms of refining the data collection process and the computation of statistical indicators. In the same vein, external audits as an ongoing exchange of information with the hospitals is a continuous improvement process.

The success of these tools has to be evaluated in terms of the use to which the information is put to influence provider behaviour and, thus, improve performance and quality of care.

The ingredients have been selected and mixed together. The next step, though is crucial - it is to know how the cake tastes.

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