



Saving children — an audit system to assess under-5 health care

A Krug, R C Pattinson, D J Power

Objective. To develop and pilot an audit system usable by medical officers in peripheral hospitals for deaths of children under 5 years to: (i) identify and classify all causes of deaths; and (ii) to identify substandard care and missed opportunities for intervention and to classify these as modifiable factors.

Setting. The four public sector hospitals in Mafikeng health region in North West province.

Method. An action research methodology was used. The system for classifying under-5 deaths was based on the *International Classification of Diseases 10 (ICD-10)*, but modified for practical application in peripheral hospitals. Each death was analysed at a mortality meeting and factors related to the family, administration or actions or omissions by health care workers that could have contributed to the death were recorded. These factors were later grouped and categorised. During the last month of the pilot participating health care workers evaluated the audit system and completed a semi-

structured questionnaire.

Study period. 1 November 2000 - 31 October 2001.

Results. Two hundred and thirty-nine under-5 deaths occurred and were discussed during 61 mortality meetings. A workable system to identify and classify causes of deaths and modifiable factors occurring within the health system was developed and tested. A simple, user-friendly one-page data sheet encompassing the whole audit was developed. Overall the health care workers were positive about the mortality meetings and were confident that the classification systems developed could be applied in other peripheral hospitals.

Conclusion. The audit system (called the Under-5 Health Care Problem Identification Programme (U5PIP)), was piloted under normal service conditions and is usable and acceptable for peripheral hospitals.

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For 1999 the estimated infant mortality rate (IMR) for South Africa was 54 per 1 000 live births and the under-5 mortality rate 69 per 1 000 live births.¹ The under-5 mortality rate and IMR are basic health and development indicators. Infant and child mortality had decreased worldwide due to targeted primary health care and child health programmes, e.g. GOBI FFF. However, owing to the present HIV/AIDS epidemic infant and under-5 mortality rates are rising.² Peripheral hospitals have an increased workload. Health workers are affected and infected by HIV/AIDS, which further leads to deterioration of care. Although training programmes in less-developed countries have aimed at improving quality of health care, many of them have had little sustainable effect.³

Vital registration in South Africa greatly underestimates the number of deaths, and causes of death are often inaccurate; the lack of registration is worse in rural areas.⁴ An important step to improve under-5 mortality data is to identify and classify all deaths occurring within the health system, especially in

peripheral hospitals and clinics.⁵ Although this will not give IMRs or under-5 mortality rates, it will be an important baseline and outcome measure for health services.

Many countries use clinical audits to improve quality of care in different fields of medicine.^{6,7} Thomson O'Brien *et al.*⁶ define clinical audit and feedback as 'any summary of clinical performance of healthcare over a specified period of time. The summary may include recommendations for clinical action. The information may be given (to health professionals) in a written, electronic or verbal form.' Pattinson⁸ defines audit as 'seeing whether the right thing is being done. Audit is a potent method of identifying problems in the healthcare service and enabling changes in the health service to occur.'

A clinical audit can analyse structures in the health care system, e.g. staffing or the availability of drugs and equipment. It can also measure process indicators of health worker performance or indicators of patient outcomes or any combination of these.⁶ In a mortality audit, deaths are identified and classified, patient records are reviewed and both structural aspects and processes in the health care system can be analysed.

Thomson O'Brien *et al.*⁶ stress the importance of linking audit to feedback, preferably feedback where health workers involved participate actively. Audit and feedback will not be effective if barriers to changing practice are not analysed and addressed.⁶



The concepts of the audit meetings are similar to other quality improvement activities.

1. Preconditions are trust, mutual respect and confidentiality. In the case discussions patients' and health professionals' names are not mentioned in order to ensure confidentiality.⁹

2. The multiprofessional team consists of doctors, nurses, relevant health managers and other health workers caring for the child. The approach is participatory; it is crucial to facilitate communication between the different professionals. The leading question is: Are there modifiable factors that could have altered the outcome (i.e. death) related to family behaviour, health administrative services or medical personnel (doctors and nurses)? The team should identify barriers to change and look for solutions to overcome them.

3. The facilitator has to be an experienced physician and his/her role is to be a coach/trainer, in a non-judgemental, non-threatening manner. The audit meeting is a learning experience and peer review, not a court of law. If the facilitator becomes judgemental, especially when criticising junior health workers, they will stay away, and no learning will take place. When discussing deaths, health workers tend to become emotional; this needs a balanced, experienced approach to make use of 'teachable moments'.

A precondition for audits is that health workers involved agree on standards and guidelines for the care they render. The purpose of standards and guidelines is to reduce inappropriate practice and to improve efficiency in health care. The development, dissemination and implementation of guidelines need careful planning.³

An outcomes audit based on mortality and used as a diagnostic tool for assessing under-5 health care is based on two assumptions: (i) the study of a 'few but important' cases (deaths) will detect problems in care that reflect problems occurring generally in this health care system; and (ii) problems that lead to a paediatric death are the same as problems of other sick children, but they are more severe.⁸

There is a need for a simple audit system monitoring under-5 deaths, which can be used in peripheral hospitals to identify problems within the health care system. It should enable health care workers (nurses, doctors, health managers) to solve some of these problems. This audit system will be based on the same principles used in the Confidential Enquiry into Maternal Deaths and the Perinatal Care Surveys of South Africa.^{10,11}

The aim of the study was to develop and pilot an audit system for under-5 deaths to diagnose problems in under-5 health care, usable by medical officers in peripheral hospitals.

Methods

The process of developing and piloting the audit system took the form of action research. Action research is often linked to

the implementation of new processes or interventions at institutional level. It involves quantitative and qualitative data collection and is adapted as the process evolved. This was the case with the regular audit meetings at the different study hospitals. Feedback from these meetings initially modified the processes and tools.

Internationally the *International Classification of Diseases 10 (ICD-10)* is the gold standard for disease classification, but it is too comprehensive to be used in routine audit meetings in busy district hospitals in less-developed countries. A classification of 48 categories of causes of death was developed, based on the *ICD 10*, the South African Standard treatment guidelines and the World Health Organisation Integrated Management of Childhood Illness (WHO IMCI) programme.^{5,12,13} In paediatric patients there is often more than one cause of death,² and a paediatric audit system must provide for this possibility. In the present system one main cause of death, two other causes of death and up to two other contributing conditions can be entered. The 'main cause' is the probable cause that finally led to the death of the child; 'other causes' are severe diseases, which were also present during the days before the child died. 'Contributing conditions' are health-related problems in the child, which may not have a clear causative link to the death.

Children with HIV/AIDS were classified in the following way:¹⁴

1. AIDS: children, who had AIDS clinically according to the adapted WHO case definitions and who had positive HIV tests. In these cases AIDS was entered as the main cause of death.

2. Clinically HIV-positive: children who had symptomatic HIV disease or who had AIDS clinically, but who could not be tested (in most of these cases the parents declined the test).

3. HIV-positive, tested and symptomatic: children who had symptomatic HIV-disease and positive HIV tests.

The classification of deaths developed in this study can be used in district hospitals, where access to postmortems and microbiological investigations is limited. The classification process relies on patient records, clinical judgement and consensus opinion of doctors and nurses at audit meetings. It can be seen as the best achievable classification process under local circumstances. The 48 different categories were chosen because each of them requires different actions in diagnostic and therapeutic case management. The classification is therefore a compromise between the full *ICD-10* and classifications of only 6 or 8 causes of death, frequently used in low-income countries, which do not distinguish between different treatment options available in district hospitals in South Africa. (The classification of causes of death can be obtained from the authors on request.)

The standards used in this audit are the South African Standard Treatment Guidelines for primary health care and for hospital paediatric care with local adaptations,¹³ the IMCI



guidelines,¹² and the South African national norms and standards for equipment in district hospitals.¹⁵ The performance of the health system is measured against these standards and thus substandard care can be identified and analysed.

Mortality audits are more effective if they are done in a systematic manner and if tools (like the Perinatal Problem Identification Programme) are used.¹⁶ The tools guide health workers to identify and classify all deaths that have occurred. The next step is to identify substandard care and missed opportunities for intervention, which are called 'modifiable factors' in this study. Modifiable factors were defined as events, actions or omissions contributing to the death of a child or to substandard care of a child who died, and which, by means of locally achievable interventions, can be modified.

A list of modifiable factors was developed, including the categories family/caregiver-related problems, administrative problems, and medical personnel-related problems.¹⁷

An example of a caregiver problem is giving an enema at home, which results in injury to the anus of the infant. Administrative modifiable factors include organisation of health care and logistical aspects. The most basic administrative problem is lack of documentation of patient care. An audit can only evaluate care that has been recorded in the patient's file. Consequently lack of documentation is considered an administrative modifiable factor. Feedback from the audit and corrective interventions should lead to more complete record keeping — only then will the evaluation of health care rendered be accurate. The lack of a pulse oximeter for a child with severe pneumonia in a district hospital is an administrative problem. A medical personnel problem might be a child in hospital with severe dehydration and shock who only receives oral rehydration, although resources for intravenous or intraosseous treatment are available.

Medical personnel-related problems are further divided into levels of care.

1. Primary health care (PHC), e.g. a child was taken to the clinic for 5 consecutive months because of a cough. The child did not gain weight. The flat weight graph was plotted, but the clinic staff took no action.

2. Admission and emergency care in hospital. This is usually rendered by all doctors and nurses working in the hospital.

3. Routine care. This is provided by staff in paediatric wards. Ideally this staff should be more stable and receive more specific training in paediatric care.

Medical personnel-related modifiable factors are further divided into three categories: (i) assessment of the child; (ii) monitoring, and (iii) case management, which includes treatment, feeding and follow-up. An example of an assessment problem might be a child admitted to hospital for chronic cough, but the admitting health worker does not enquire about tuberculosis contact. A monitoring problem

might be a child with severe pneumonia in hospital on oxygen, but the oxygen saturation is not monitored although a pulse oximeter is available. An example of a case management problem might be a malnourished child with very severe pneumonia who only receives oral amoxicillin as antibiotic.

This stringent classification method for modifiable factors was used to give direction during the audit meeting and to focus on problem areas, where change is needed. To be specific about the modifiable factors facilitates decisions on specific interventions. (The classification of modifiable factors can be obtained from the authors on request.)

Regular audit meetings were held once or twice a month during the study period from 1 November 2000 to 31 October 2001. During the last audit meetings at the study hospitals in October 2001 the participating health workers were asked to fill in a semi-structured anonymous evaluation form. It was designed to find out how health workers viewed their experiences with the audit system.

A one-page data sheet was developed and was completed during the audit meetings. It contains basic patient data from the patient's file and from the road-to-health card. (The data sheet can be obtained from the authors on request.) The data were entered into an Access database (Microsoft) and form the basis for analysis. The information was entered from the patients' records and audit meetings into the Access database. Feedback was given to health workers in the audit meetings monthly and to health managers every 6 months.

The audit tools were piloted in the four public sector hospitals in North West province. The objectives of the pilot were to assess whether this audit system is feasible and acceptable for health workers and managers, and where the tools have to be modified.

The pilot included a prospective descriptive study of under-5 deaths occurring in the study hospitals in Mafikeng region, South Africa, between 1 November 2000 and 31 October 2001. Doctors and nurses involved in paediatric care attended and participated in the regular audit meetings. This was part of their normal duties, but there was no coercion to attend. During the audit meetings records of all under-5 deaths were reviewed, and consensus on causes of death and modifiable factors was reached. This process of reviewing and discussing the patients' records and care involved varying degrees of interpretation and clinical judgement. Inference about the impact of modifiable factors resulted from group discussion and consensus, and although guided by guidelines and standards, it remains subjective to a certain degree.¹⁹ (The tools, standards and criteria used in the pilot are available on request.)

Permission to conduct the study was granted by the Ethics Committee of the University of Pretoria, by the North West Department of Health and by the superintendents of the study hospitals. The only other procedures performed were the



voluntary interviews with the mothers/primary caregivers. Informed consent and confidentiality were adhered to.

Results

During the pilot 239 under-5 deaths occurred in the study hospitals. Twelve patient files were lost and the road-to-health card was missing in 102 files; consequently care at primary level could be analysed in only 125 cases.

The ward doctor prepared all cases for the monthly audit meetings, where they were discussed by doctors and nurses involved in paediatric care. Causes of deaths are published in our second paper.¹⁸ In 4 cases causes of death could not be determined.

Modifiable factors in the care of children were identified at caregiver/family level in 32% of cases. Eighty-three per cent of cases had administrative modifiable factors. Health worker-related modifiable factors occurred in 64% of cases at PHC level, in 47% at admission/emergency care level and in 55% of cases during routine care. The categories of modifiable factors found are published elsewhere.¹⁸

Sixty-one audit meetings were held at different study hospitals during the study period. At Mafikeng Provincial Hospital (MPH) audit meetings took place every 2 weeks because of a greater number of admissions and deaths, while in the other hospitals they occurred monthly. Experience has shown that if audit meetings are conducted less frequently, health workers cannot remember the cases. A total of 22 audit meetings were held at MPH, and 39 in the district hospitals. The number of doctors attending the meetings varied between 3 and 12; and the number of nurses and other health workers between 1 and 16. Ten meetings at MPH and 22 in the district hospitals were held without clinic nurses present. The duration of the meetings varied between 1 and 2.5 hours. The number of cases discussed varied between 2 and 13.

In October 2001 the attending health workers evaluated the audit meetings using a semi-structured questionnaire. Twenty-four health workers were present at the evaluation and all participated voluntarily. There were 12 doctors, 2 clinic nurses, 1 nursing service manager and 9 hospital nurses. Three participants had attended only 1 audit meeting, 7 had attended 2 - 4, 5 had attended 5 - 8, and 9 had attended 9 or more. No health worker declined to participate in the evaluation. All participants felt that they would recommend the audit meetings to their colleagues, 22 feeling that they would recommend them strongly. Five participants commented that they would like to start a similar process for adult inpatients.

The most common positive aspects mentioned by participants were that the audit meetings are educational and improve case assessment, case management, record keeping and communication. Negative comments were that meetings were sometimes ineffective because of poor attendance by health workers, especially clinic nurses.

Discussion

This study has a number of limitations. The data are largely hospital based; therefore it is not possible to comment on under-5 deaths occurring in the community, outside the health facilities. It is estimated that 60 - 80% of under-5 deaths in less-developed countries may take place in the community.²⁰ The inter-observer variability, when allocating causes of death, is also not known.

This pilot involved regular health workers (nurses, doctors, health managers). They were trained to use the audit system, to identify and analyse their own problems in service delivery and to prioritise interventions. To prepare cases for the audit and to attend audit meetings is part of their normal duties. Therefore the only additional costs for this audit were the development of the database and the tools and the time of the regional paediatrician to motivate and train for the audit, which could be done as part of the normal workload.

This audit is an internal assessment system for hospital paediatric care. It gives health workers a baseline for outcomes and problems at their institutions. As it is an ongoing audit, the effectiveness of interventions implemented can be monitored.

The following problems need attention in audit implementation: (i) staff shortage leads to poor attendance at audit meetings during times and in health facilities where quality improvement is most needed; and (ii) it remains a challenge to ensure adequate attendance from the district — only if this occurs will the audit have an impact on primary health care.

Conclusion

This audit system (U5PIP) is usable and acceptable for health workers in peripheral hospitals in South Africa, and is relevant to their training needs. It can be used as a first step in comprehensive quality improvement programmes. Other hospitals are encouraged to use it so that a comprehensive picture of under-5 health care can be ascertained and programmes to change modifiable factors can be developed.

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ORIGINAL ARTICLES

References

1. UNICEF. *The Progress of Nations 2000*. Geneva: UNICEF 1999: 16-17.
2. South African National Department of Health. *Demographic and Health Survey 1998. Preliminary Report*. MRC, Macro, South African National Department of Health, 1998.
3. World Health Organisation. *Improving Quality of Paediatric Care in Small Hospitals in Developing Countries. Report of a meeting Geneva 19-21 June 2000*. WHO/FCH/CAH/01.25. Geneva: WHO, 2001.
4. Cassim MM. Vital registration infrastructure initiative. *Epidemiological Comments* (South African National Department of Health) 2000; **2**: 12-19.
5. Central Statistical Service. *ICD 10 International Statistical Classification of Diseases and Related Health Problems*. Pretoria: CSS, 1996. (Based on the *International Statistical Classification of Diseases and Related Health Problems*, 10th revision. Geneva: WHO, 1992.)
6. Thomson O'Brien MA, Oxman AD, Davis DA, Haynes RB, Freemantle N, Harvey EL. Audit and feedback: effects on professional practice and health care outcomes (Cochrane Review). In: *The Cochrane Library*, Issue 3, 1999. Oxford: Update Software.
7. Mancey-Jones M, Brugha RF. Using perinatal audit to promote change: a review. *Health Policy Plan* 2001; **12**: 183-192.
8. Pattinson RC. Practical application of data obtained from a perinatal problem identification programme. *S Afr Med J* 1995; **85**: 131-132.
9. Carne S. Enquiries into infant deaths. *J R Coll Gen Pract* 1983; **33**: 541-542.
10. Moodley J, Pattinson RC, Bennun M, et al. A review of maternal deaths in South Africa during 1998. *S Afr Med J* 2000; **90**: 367-373.
11. Medical Research Council Unit for Maternal and Infant Health Care Strategies. *Saving Babies 2001 – Second Perinatal Care Survey of South Africa*. Pretoria: University of Pretoria and South African National Department of Health, 2002.
12. World Health Organisation and UNICEF. *Integrated Management of Childhood Illness*. Geneva: WHO, 1997. South African generic adaptations by the South African National Department of Health. Pretoria: DOH, 1999.
13. South African National Department of Health. *Standard Treatment Guidelines and Essential Drug List. Hospital Level Paediatric*. EDP South Africa 1998. www.sadap.org.za/edl/paed
14. Grimwood A, Hussey G. *HIV / AIDS and the Family – A Clinical Guide*. Cape Town: University of Cape Town Child Health Unit, 1998.
15. South African National Department of Health. *The Primary Health Care Package for South Africa: National Norms and Standards for District Hospitals*. Pretoria: DOH, 2001.
16. Ward HRG, Howarth GR, Jennings OJN, Pattinson RC. Audit incorporating avoidability and appropriate intervention can significantly decrease perinatal mortality. *S Afr Med J* 1995; **85**: 147-150.
17. Pattinson RC, Makin JD, Shaw A, Delpont SD. The value of incorporating avoidable factors into perinatal audits. *S Afr Med J* 1995; **85**: 145-147.
18. Krug A, Pattinson RC, Power D. Why children die: An under-5 health care survey in Mafikeng region. *S Afr Med J* 2004; **94**: 202-206 (this issue).
19. Nolan T, Angos P, Cunha AJ, et al. Quality of hospital care for seriously ill children in less-developed countries. *Lancet* 2001; **357**: 106-110.
20. Duke T, Michael A, Mgone J, Frank D, Wal T, Sehuko R. Etiology of child mortality in Goroka, Papua New Guinea: a prospective two-year study. *Bull World Health Organ* 2002; **80**: 16-25.

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