REVIEW

The role of communication in paediatric drug safety

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Medication errors cause substantial harm to patients, and considerable cost to healthcare systems. Evidence suggests that communication plays a crucial role in the generation, management and prevention of such incidents. This review identifies how paediatric medication errors can be managed, and in particular focuses on the pathway of steps that can operationalise the current research findings. Furthermore, the current data suggesting how communication can help to prevent errors occurring in the first place is examined. From this data, it is apparent that there are three domains in which communication could play an important preventative role: first, patient doctor communication, and second interprofessional communication and finally researcher/professional dialogue. This review is an attempt to identify the importance of communication in paediatric mediation safety and to allow practical application of these findings.

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> To err is human; to forgive, divine
> Alexander Pope, 1711

> To err is human; to fail to learn is inexcusable
> Susan Sheridan, Vice President, Consumers Advancing Patient Safety, 2004

It is 01:00 h in the morning in a busy district general hospital, and accident and emergency is heaving. An 8-year-old Somali boy is admitted with pneumonia. The family speaks very poor English. The accident and emergency department doctor notes a funny rash that appeared the last time the child had a sore throat and was given a drug that his mother could not remember the name of. The child reaches the ward where the first dose of intravenous penicillin is given. A few hours later, the senior house officer on call is bleeped to say the child is covered in an urticarial rash.

Variations on the above scenario are familiar to paediatricians, and especially when they lead to deaths involving children, are high profile.[1][2] Complications from medicines are the most common source of medical errors in hospitals.[3] In paediatrics in both the hospital and the community setting, this is also an important cause of morbidity.[4-7] The complex series of interactions between patients and healthcare professionals that lead to drugs reaching the patient have been described as the "medication system".[8] In the literature on both adult and paediatric drug safety, there has been considerable focus on various important aspects of this system, both cataloguing errors and suggesting preventive strategies. The

prescribing process and the use of information technology to reduce such errors have been the focus of much research attention.[9-11] Currently, there is a paucity of safety literature on how the nature of the patient–doctor communication affects errors.[12][13] This is a complicated topic, particularly in paediatrics, where such communications may often be three- or even four-way conversations, as a patient, family member, doctor and interpreter (and maybe even a school nurse or day care giver) may be involved.[12] This paper intends to examine the current evidence from paediatrics, transfer ideas from adult medicine and develop strategies for operationalising the evidence. Our aim is to produce practical, clear guidance on how best to improve the patient–doctor interaction and thereby patient safety.

HOW DOES COMMUNICATION PLAY A ROLE IN THE MANAGEMENT OF DRUG INCIDENTS?

First, the acute medical needs must be handled. In the above scenario, one possible cause for the urticarial reaction is an acute drug reaction to penicillin. This should be treated appropriately with antihistamines. Although in the above scenario the medical management is clear and straightforward, more complicated and rarer events such as intrathecal vincristine administration, which may result in death, require the use of a broader range of clinical resources and should rely on clear concise communication to achieve this quickly.[14]

Second, there needs to be recognition that an adverse drug event has probably occurred.[15][16] Recognition relies heavily on communication, because to achieve this, patient safety and in particular drug safety need to be high on the policy agenda at both local and national levels. In the UK, this process started with the publication and dissemination of *An Organisation with Memory* in 2000 by the Department of Health, which examined the causes of error[17] and followed up with *Building a Safer NHS [National Health Service] for Patients* in 2001, which examined the implementation of prevention strategies[18] and *Making Amends* in 2003, which looked at strategies to compensate those who have experienced medical errors.[19] The creation of the National Patient Safety Agency (NPSA; http://www.npsa.nhs.uk/, http://www.npsa.nhs.uk/2005) was a further step towards raising the profile of safety issues. This too has examined the causation of errors and the cost effectiveness of strategies to reduce them.[20] But, crucial to its remit is the dissemination of

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Abbreviations: ADE, adverse drug event; FHL, functional health literacy; NPSA, National Patient Safety Agency

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patient safety messages to the grassroots in innovative ways—for example, a campaign to reduce nosocomial infection has been initiated by using screen saver advertisements on hospital PCs.[21] A recent publication *Medical Error* was mailed to over 40 000 doctors and contained very personal accounts by leading doctors about their own medical errors in an attempt to highlight the issues, and to encourage reporting of errors.[22]

Once an error has been recognised, this needs to be communicated to both local and national bodies.[23] At a local level, this permits the initiation of further investigation of the causes of the error. Hospitals in the UK are currently using a traffic-light system of error reporting to prioritise such investigations. At a national level, this allows collection of data on the epidemiology of such errors, identification of trends and development of error-reduction strategies. Thus, repeated occurrence of errors can be prevented with such a strategy in place. The recurrence of administration of intrathecal vincristine and the subsequent adverse events may have been avoided by such a system, as counter measures could have been instituted earlier if the extent of the problem had been recognised faster.[14] Medicine has looked to other industries for effective reporting systems—the aviation industry developed reporting schemes which are non-punitive, generally voluntary and report to national regulatory bodies.[24] Using these key features, the NPSA launched its National Reporting and Learning System in February 2004. This is an anonymised voluntary reporting scheme.[25] Data from local reporting schemes are fed directly to the NPSA; in addition, staff from healthcare institutions (and eventually patients) provide reports. Whatever the type of reporting system adopted, the key to success is that a reporting system facilitates a dialogue between the reporters and the reporting body. Evidence from the US shows that reporting is improved if conclusions from investigations are fed back to the grass roots, and changes, as a result of the reports, are clearly seen.[23 26]

Once a report is lodged, the process should then lead to a thorough investigation of the events leading to the incident. Various techniques, such as root cause analysis and failure modes effects analysis, have been developed to understand the range of factors that contribute to the incident. These rely on investigators interviewing all those involved in the incident and teasing out the salient factors that led to the error.[27] These techniques are based on the principle of a "culture of safety" rather than "blame". This means that rather than using the investigation to point a finger at an individual, the remit is to discover where the system failed.[28 29] In the UK, this concept of shared responsibility is beginning to reach policy makers and local healthcare providers. For example, the development of the Medicines for Children and the Children's British National Formulary demonstrate that the system has a responsibility to provide clear information on drugs to healthcare providers rather than relying on individual knowledge, and that this information should be paediatric specific.[30 31] Vincent[32] outlines how to start the investigative process based on James Reason's error theory. First, the "unsafe act" that led directly to the incident must be identified, and then further work must be carried out to isolate the "latent failures" and "error-producing conditions" that occurred.[32 33] For example, in the case discussed initially, the unsafe act would be the prescribing of penicillin to a child who has already probably had an allergic reaction to the drug. Contributory factors might include the heavy workload, the time of the day, the relative inexperience of the prescriber and the failure of the original doctor seeing the child to clearly communicate the potential allergic reaction to medical and nursing colleagues, as discussed in more detail below. Key to such a process is the identification of those events that are specific to the incident and those that are more general.

The penultimate step in coping with drug incidents is talking with the family. This phase should involve three components: presentation of the results of investigation into how the incident came about, a thorough apology and information on how this will be prevented in the future.[34 35] For many healthcare practitioners, this is a very difficult step.[37] Wu *et al*[37] found in 1991 that 76% of house officers had not disclosed involvement in a serious error. This is for a multitude of reasons: difficulty in formulating the communication and/or fear about the consequences.[38 39] However, this is a betrayal of patients' desires. Gallagher *et al*[35] found that patients "were unanimous in their desire to be told about any error that caused them harm"; they were slightly more ambiguous in their feelings towards disclosure of near misses. Data also seem to suggest that doctors' hold erroneous views that disclosure of errors will make potential financial penalties worse. Kraman *et al*[40] carried out a case study in Kentucky. One of the Veterans Administration hospitals had adopted a radical policy of full disclosure in the case of medical errors, even when the family/patient did not suspect an error. The experience of this hospital was compared with that of Veterans Administration hospitals located close by, with similar characteristics but who did not adopt a policy of full disclosure. The study suggests that liability payments are comparable between institutions.[40] Disclosure may be more likely if healthcare practioners feel supported. Wu *et al*[39] have coined the term the "the second victim" to describe the concept that healthcare providers are also affected by errors and need help after an event.

The final step in the pathway for dealing with errors is the dissemination of findings of investigations, both to the patients and their families as mentioned, and to a wider audience such as other similar hospitals or units, both nationally and internationally. This prevents the repeated re-occurrence of similar events, which is a source of frustration to the affected families and clinicians.[41]

By examining each of these steps, it is clear that the underlying theme is communication. Communication is the key for clinicians and patients (or families) navigating the drug process and dealing with its failings.

HOW CAN COMMUNICATION PREVENT SUCH DRUG-RELATED ERRORS OCCURRING?
Patient-level communication between patients, parents and healthcare professionals

At present, little information is available that suggests that improved communication can prevent drug-related incidents. However, there is evidence from projections based on analysis of the types of current errors that communication improvements could reduce errors. Fortescue *et al*[13] noted that 47.4% of all inpatient drug errors could have been prevented by improved communication between doctors and patients.

Increasing evidence suggests that although not all patients want more information, many do[42]; there is, however, disagreement about how and when best to supply this information.[43] Some argue that doctors should act as "navigators" of the system for and with patients, others argue that information should be provided to allow true "shared decision making". Some suggest that the type of interaction and information exchange depends very much on the situation; shared decision making, for example, should be used in situations where no clear evidence base is available, but[42–44]; studies to date show that at present the ideal is not fulfilled.[45–47] Many doctors find that providing information is time consuming and unfeasible. Others question the benefit of providing complex data to patients as it may actually be anxiety provoking rather than relieving. Even when doctors think that they are fulfilling patients' needs and supplying more information, it seems that they overestimate their ability to transfer

information.[48] Increasingly, the consensus is that this information provision is crucial not only to patients understanding their condition and/or treatment and to the wider picture of uncertainty in medicine.[49] The UK has taken this seriously, with the production of a series of initiatives aimed at improving the accessibility of medical information for the public—NHS Direct online and the National Library for Health are part of this drive.

However, in many ways the evidence base is not clear. Studies and reviews have shown benefit—for example, data suggest that written reminders improve compliance with screening programmes,[50] and the more personalised the written matter, the more it is used.[51] However, others have failed to show benefit in a range of outcomes—information for patients with stroke and their families did not improve satisfaction nor did information improve psychological well-being among patients with cancer.[52] [53] In part, the lack of clarity arises from the difficulty in defining the information used in each study and in part, this is because of the heterogeneity of the situations studied.

A major factor, which can skew results, is functional health literacy (FHL). This is the term used to describe patients' or parental ability to understand everyday health-related information. This factor is of paramount importance when the success of the communication depends on patients' absorption of information.[54] FHL describes both the ability to understand orally communicated health-related information and information communicated in the written form.[55] Patients struggle with both oral and written communication. In an American survey, 42% of patients could not understand instructions "to take medications on an empty stomach."[56] Patients with the lowest FHL have poorer health[57] but are not easily identifiable, as there is a poor correlation between stage of schooling and functional literacy[58]; instead, specific tests must be used, such as the Test of Functional Health Literacy in Adults.[59] However, health literacy is more strongly correlated with health status than many other socioeconomic factors, such as employment status or educational achievement.[60]

Lack of understanding of the extent of poor FHL by healthcare providers has led to the production of written matter that is not appropriate for patients, as it is beyond the average reading skills of 8th-grade level.[58] [61] Even online information is not well targeted. For example, RAND (a non-profit organisation that informs public debate by analysis and research)[62] assessed that 100% of studied websites written in English were at the 9th-grade level or higher, and six of seven Spanish language sites presented information that was at least high school level.[63] Furthermore, Eysenbach et al[64] noted that the quality of internet health sites is variable. Additionally, the difficulties in gaining access to the required information online are underestimated.[65] Paediatricians can counter problems with FHL by identifying FHL levels, pitching information at the correct level and using innovative alternative communication strategies such as videos, cartoons and multimedia-based tools, which have been shown to have high user satisfaction and some success in improving health outcomes.[66–68] The Department of Health is attempting to confront this issue with a number of pilot projects. One such is "It's Your Life", a magazine aimed at young women from poorer backgrounds. Created by Dr Foster and the department available free through healthcare facilities and high street outlets such as beauty parlours and nail saloons. This is an attempt to provide correctly pitched information and to ensure that the information is located in situations where the target group could access it.[69] This is particularly successful if young people are involved in the design process.[70]

The transfer of information is also affected by a myriad of other factors such as the language spoken. Doctors may also play a role in reducing the negative consequences of language barriers by using the best available source of interpretation. Failure to intervene in the negative effects of limited English speaking has been demonstrated to affect the perception of care[71] [72] and leads to an increased use of services at higher costs.[73] This ideal situation is not always possible, but professional interpreters improve satisfaction.[71] If professional in-person interpretation is not possible, then a less clear picture emerges; patients prefer family members, whereas doctors prefer telephone interpreters.[74] Language barriers are present even if both parties consider that they are talking the same language; patients speak in "everyday language" and doctors in "medical language". Bourhis et al[75] found that doctors thought they switched to everyday language and patients thought they switched to medical language, but neither detected the others' switch.[75] Further gains can be made, even where limited English speaking is not present, by training patients in communication leading to improved medical outcomes, including adherence.[76] [77]

Studies suggest that improved communication is correlated with a higher recall of information,[78] and may improve adherence and reduced relapse of disease.[79] [80] These are key factors in reducing drug-related incidents. Furthermore, there is some evidence that the effect of communication goes beyond this to better health status[81] and reduced malpractice claims.[82] In the UK, improving communication between staff and patients has been shown to improve health hygiene; a tool kit developed by the NPSA including badges for staff with "It's OK to ask" showed an increase in hand washing by staff. Staff were also pleased by the involvement of patients—34% had been asked by a patient about hand washing.[83]

In paediatrics, as previously stated, the doctor–patient relationship is a two-way conversation but a tri-way discussion. Despite evidence that communicating directly with the child improves adherence and satisfaction,[84] studies suggest that the child contributes only 10% of the consultation.[85] [86] However, studies tend to concentrate on oral communication and it may be that non-verbal communication is important to children.[86] The type of information transfer is also different between children and their parents. Children are involved far more in information gathering than in decision making,[87] and in social and psychosocial issues than in purely medical issues.[88] Tates et al[89] suggest that this is because the combination of the parent and doctor align to inhibit child participation. Tates and Meeuwesen[90] go further and suggest that whereas doctors attempt to moderate child involvement depending on the child's age, parents seem to restrict child involvement in general practice consultations "irrespective of their child's age". Therefore, strategies to improve this tri-way communication rely on acknowledging these constraints and overcoming them—for example, by encouraging children's involvement in their health and heathcare needs at home.[91]

To summarise, during the patient–physician interaction, many factors intertwine, including successful communication, to produce a successful outcome. Studies have examined many outcome measures, but, so far, the closest measure to drug error and adverse drug events seems to be adherence. This has been shown to improve if there is better information transfer and communication. This article has concentrated on the standard face-to-face consultation, but the complexities will only increase as video-conferencing, email consultations and other changes to practice develop.

COMMUNICATION BETWEEN HEALTHCARE PROFESSIONALS

As mentioned earlier, communication between healthcare practitioners is important for error reduction and increasing evidence is

available that this is appreciated at a national level with the introduction of the Childrens' British National Formulary.[30] Conceiving and producing this publication was an acceptance that it is incumbent on those who do know how to prescribe in a user-friendly manner to make the knowledge available to others, particularly those in training or those who practice a limited amount of paediatrics, such as general practioners.

Similarly, communication is crucial to another error reduction strategy: development of teamwork. Fortescue et al[13] identified that 17.4% of errors that occurred in an inpatient paediatric setting could have been prevented by improved communication between doctors and nurses. The authors cite as an example nurse participation on morning rounds. In addition, participation of pharmacists on such rounds could have had a considerable effect on error rates. The benefit of the pharmacists was partly owing to the fact that they "could lead to more informed decision making" by communicating their knowledge with the prescribers.[13] Studies before this have also suggested the benefit of such interactions between doctors, nurses and pharmacists.[92–94] Leape et al[3] re-engineered the delivery of health care on an intensive care unit at a tertiary referral hospital to include a pharmacist on rounds, and found a 66% reduction in the rate of preventable adverse drug events (ADEs) in the study unit as compared with the control unit.

A further mechanism to improve interdisciplinary communication is crew resource management, a technique designed to eliminate the negative effect of hierarchy and thereby reduce problems associated with poor communication, which was developed in the aviation industry. This is a technique that builds teamwork and empowers every member of the team to feel responsible for safety.[95] Sexton et al[96] identified that hierarchy and communication of concerns are also factors in the healthcare arena. This technique is starting to be used in medicine—in anaesthetics, surgery, the emergency room[97] and, most recently, in the labour ward.

Error reduction is also greatly enhanced by technology; again, this is partly through improved communication.[98] At the ordering stage, the major change has been the development of computerised physician order entry systems, sometimes in association with clinical decision support systems. Different computer systems exist that perform different functions, but essentially computerised physician order entry systems allows electronic prescribing of drugs, ensuring that prescriptions are completely legible and standardised.[99 100] Clinical decision support is almost always provided, which allows information to be conveyed to the prescriber in real time, such as optimal drug choice, dose choice or key patient laboratory values. Research has repeatedly shown clinical benefits of such systems, in both adult medicine and paediatrics,[5 13 101] although computerisation is not without errors.[102] Clinicians require complex and up-to-date patient information to aid decisions, but accessing this information, particularly in a timely manner, can be difficult. Poon et al[103] looked at current practice and found that only 41% of doctors were satisfied with the current report result management. Tate et al[104] and Poon et al[105] have developed systems to improve doctor warning of potentially life-threatening laboratory results, by developing automated transfer of results to pagers.

Communication is also the key to successful integration of technology in the medical system. Failed adoptions of technology have been caused partly by poor interactions between those pushing for automation and those using the new technology.[106 107] Moreover, error-reduction strategies have been partially developed from successful interventions in other industries, particularly in the aviation industry.[108]

Communication plays a further fundamental role in the prevention of drug incidents. As the field of patient safety has developed, so has the terminology used to explain and understand the complex ideas regarding harm and potential harm that can occur during the medication process. However, confusion has arisen, in part, because as the field has grown, the need for more and more specific terminology has arisen. This has made some of the early prevalence studies difficult to interpret and compare with current studies.[109] Difficulties have also arisen partly because some definitions already existed and people have adopted these rather than transferring to newer definitions. The classic example of this is the term adverse drug reaction. This is an idea that has long been present in medicine—that drugs even prescribed correctly can cause harm. This has been the essence of many national reporting systems such as the UK's Yellow Card scheme. Within the newer framework of patient safety, these events are now classified as subgroups of ADEs—that is, non-preventable ADEs.[110 111] Therefore, it is hard for readers of this literature to disentangle the various definitions and interpret the data correctly. The work being carried out by the World Health Organization World Alliance for Patient Safety on taxonomy will help to ensure that this type of confusion is reduced in the future.[112]

Just as the lack of clear communication of definitions has led to confusion, so has the variety of methodologies for assessing prevalence of errors. First, early studies examined medication errors not ADEs.[113 114] Second, methods have evolved, resolving some problems and also creating new ones. Initial studies relied on direct observation of the medication process; current studies tend to rely on retrospective or prospective review of medical notes, charts and prescriptions.[3 5 15 115 116] Furthermore, in paediatrics, the methods used may be further divided into two types: (1) studies that collect data from pre-existing hospital reporting systems[117–119] and (2) cohort studies, both prospective and retrospective, which collect their own data.[4 92 120] Thus, comparisons over time and between countries can be problematic if these limitations are not clearly communicated.

The challenge to researchers is clear. Just as communication must improve to prevent and manage errors when they occur in the clinical setting, so must researchers ensure that the terms and methods used are transparent. Dialogue within the research community would thus be enhanced, but, more importantly, this would improve the ability for non-experts to access complex, yet vital information.

CONCLUSION

Drug-related incidents are common, costly and often, particularly in children, result in severe morbidity and mortality. Communication is crucial to both dealing with errors once they have occurred and preventing their occurrence. Patient safety is an evolving field, and paediatrics with its unique pharmacoepidemiology is an especially complex field. As the world of medicine grows more and more complicated and the demands placed on healthcare practitioners keep increasing, we must respond to this by improved communication to ensure that drug-related incidents do not occur and that when they do, they are dealt with appropriately. This will ensure that the individuals involved, patient, family and doctor, have the harm minimised. Only in doing this will we be truly fulfilling the oath of Hippocrates—"first do no harm."

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