Dissemination and uptake of a new treatment pathway for paracetamol poisoning in the UK: a survey of healthcare professionals

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WHAT IS ALREADY KNOWN ABOUT THIS SUBJECT

- The UK medicines regulator announced changes affecting the treatment pathway for paracetamol poisoning in September 2012, with the intention that they should be implemented immediately.
- The extent to which advice from medicines regulators is conveyed to healthcare professionals and translated into practice is known to be variable.

WHAT THIS STUDY ADDS

- In the first 12 weeks, less than two-thirds of healthcare professionals were aware of the changes, and half reported changing their practice.
- Practice change seemed to occur more reliably among those who reported having received practical implementation instructions (e.g. a protocol).
- Better methods for communicating time-critical, practice-changing announcements must be found.

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AIMS

On 3 September 2012, the UK Medicines and Healthcare Products Regulatory Agency (MHRA) notified healthcare professionals of immediate changes to the intravenous acetylcysteine license terms, altering the treatment pathway for paracetamol poisoning. We sought to evaluate awareness of this amongst healthcare professionals.

METHODS

We surveyed doctors, nurses and pharmacists in the 1–12 week period following the implementation date.

RESULTS

Forty-four individuals completed the survey in paper form (response rate 86%) and 220 in electronic form (response rate unknown). The resulting sample of 264 individuals was drawn from 41 institutions, and included 143 doctors, 58 pharmacists and 50 nurses. Of these individuals, 157 (59%) were aware of the changes, and 133 (50%) had adopted them in practice. Awareness differed between healthcare professions ($P = 0.001$) and specialties ($P = 0.002$). For respondents aware of the changes, the main sources of information were alerts issued internally (reported by 57%), from the MHRA (25%) and from other professional bodies (24%). The proportion of individuals who reported receiving practical implementation instructions (e.g. a protocol) was higher among respondents who had changed their practice than for those who had not (86 vs. 25%, respectively; $P < 0.001$).

CONCLUSIONS

Less than two-thirds of healthcare professionals in specialties managing patients with paracetamol poisoning were aware of important changes to its treatment pathway in the 12 weeks after they took effect, and only half had adopted them in practice. Alternative communication strategies should be explored to improve dissemination of similar information from the MHRA and other medicines regulators in the future.

Introduction

Paracetamol poisoning is common, particularly in the UK, where it accounts for more enquires to the National Poisons Information Service than any other substance [1]. It is the commonest cause of acute liver failure in most developed countries [2]. Acetylcysteine is an effective antidote, which almost completely prevents hepatotoxicity if started within 8 h of paracetamol ingestion. During 2011/2012, the UK medicines regulator (the Medicines and Healthcare Products Regulatory Agency; MHRA) undertook a review of the management of paracetamol poisoning, particularly relating to the indications for use and the administration regimen for intravenous acetylcysteine [3]. In light of this, the Commission on Human Medicines (an advisory body within the MHRA) recommended changes to the license terms for intravenous acetylcysteine, which were reflected in changes to its summary of product characteristics. Most significant among these were as follows:

- Removal of the reference to two 'treatment lines' on the plasma paracetamol concentration nomogram, and their replacement with a single line commencing at 100 mg l⁻¹ at 4 h (previously the 'high risk' line).
- To indicate the use of acetylcysteine irrespective of plasma paracetamol concentration when the overdose is staggered or its timing is uncertain.
- The provision of weight-based dosing tables.
- An increase in the infusion time for the first dose from 15 to 60 min.

The MHRA announced these changes on 3 September 2012, with instructions that they should be implemented immediately [3]; no advance warning was provided to healthcare professionals. The information was disseminated via an online alert on the MHRA website, supported by changes to the British National Formulary (from the 64th edition; September 2012); an alert to emergency medicine professionals via the College of Emergency Medicine [4]; and communication with the responsible individuals/departments within National Health Service (NHS) trusts via the NHS Central Alerting System.

We aimed to evaluate awareness of this important, time-critical, practice-changing announcement among healthcare professionals who manage patients with paracetamol poisoning. We also sought to discover how they were informed of the changes, how their implementation was supported, and whether they had adopted them in practice.

Methods

We conducted a survey of doctors, nurses and pharmacists in the 1–12 week period following the implementation date. We created a short survey with seven closed-

response items, with options for free-text responses where relevant (the survey is provided as Supporting Information Appendix S1). We piloted the survey in paper format at a national continuing professional development meeting of UK specialists in emergency medicine. We then converted it to electronic format for wider dissemination. We contacted six acute NHS trusts via their pharmacy or clinical pharmacology departments, and five agreed to participate. They identified relevant employees (doctors, nurses and pharmacists working in emergency medicine, general and acute medicine and paediatrics) and invited them to participate in the electronically administered survey. In addition, specialists in intensive care medicine in the London region were invited to participate by email. A single invitation was sent to each potential respondent. No test-retest reliability checks were performed, because it was considered likely that this would reflect more on the state of evolving awareness than on the reliability of the survey tool.

We planned to assess overall awareness levels and implementation rates, and to perform subgroup analyses according to professional categories and specialties. Awareness levels were compared between groups using χ^2 tests. Data were compiled and analysed in Microsoft Excel 2010 and Prism 5 for Windows (GraphPad Software, Inc., La Jolla, CA, USA). No personal data were collected in the survey. As the survey had no research component and did not involve patients, ethical approval was not sought.

Results

In the pilot exercise, the survey was distributed in paper form to 51 individuals, 44 (86%) of whom responded. A further 220 responses were obtained to the survey when administered in electronic form, resulting in a final sample size of 264. The overall response rate was not known, because some electronic distribution lists were concealed both to the sender and recipients. For the instances in which a denominator was available, the response rate to the electronically administered survey was 32/119 (27%).

Respondents were drawn from 41 NHS trusts, but most (81%) were from the five institutions approached directly. Overall, 157 respondents (59%) were aware of the changes to the treatment pathway, and 133 (50%) were both aware of the changes and had implemented them in practice. Awareness levels differed significantly between healthcare professions ($P = 0.001$; Table 1), being highest among pharmacists (78%) and lowest among junior doctors (46%). Likewise, there were significant differences in awareness levels between specialties ($P = 0.002$; Table 1), ranging from 74% in acute medicine to only 13% in anaesthetics. In a comparison of awareness levels between the five NHS trusts from which most respondents were drawn, these ranged from 29 to 71%, although these differences did not

Table 1

The proportions of respondents aware of the changes to the management of paracetamol poisoning, and reporting having implemented them in practice, according to professional categories and clinical specialties

	Total	Aware of changes	Changed practice
Total number	264 (100%)	157 (59%)	133 (50%)
Professional category			
Consultant/associate specialist	71	48 (68%)	40 (56%)
Junior doctor	72	33 (46%)	28 (39%)
Pharmacist	58	45 (78%)	39 (67%)
Nurse	50	24 (48%)	22 (44%)
Other	13	7 (54%)	4 (31%)
Clinical specialty*			
Emergency medicine	87	63 (72%)	54 (62%)
General medicine	63	32 (51%)	28 (44%)
Acute medicine	19	14 (74%)	13 (68%)
Intensive care medicine	24	12 (50%)	11 (46%)
Paediatrics	22	9 (41%)	8 (36%)
Anaesthetics	8	1 (13%)	1 (13%)
Other	41	26 (63%)	18 (44%)

Percentages are calculated using the row total as the denominator. The proportions of respondents aware of the changes differed significantly between professional categories ($P = 0.001$) and clinical specialties ($P = 0.002$). There were no significant differences between professional categories ($P = 0.300$) and clinical specialties ($P = 0.368$) with respect to the implementation of the changes in practice. *Where respondents listed more than one specialty (e.g. anaesthetics and intensive care), they are categorized here under the 'parent' specialty only (i.e. anaesthetics in this example).

reach statistical significance ($P = 0.063$). There was no significant variation in awareness by sampling week ($P = 0.113$). When analysis was confined to the paper-based pilot exercise, in which response rate was known, the awareness level was 24/44 (55%). This did not differ significantly from that observed when the survey was administered electronically (133/220, 60%; $P = 0.466$).

The most common source of information regarding the changes was an internal alert, which was reported by 89 respondents (57% of the 157 respondents aware of the changes; Figure 1). Among the 24 respondents who were aware of the changes but had not adopted them in practice, 18 (75%) did not report having seen any practical materials – such as a protocol, guideline, administration instructions or the new BNF monograph – to support their implementation. In contrast, among the 133 respondents who had changed their practice, all but 19 (14%) had seen one or more of these materials ($P < 0.001$). Most commonly, this was a new or revised internal protocol or guideline which, overall, 77 individuals from 16 institutions (39% of the institutions contributing respondents) reported having seen.

Discussion

Paracetamol poisoning is common and may be life threatening, but serious physical harm can usually be prevented if it is managed correctly and with necessary expedience. The changes to the use of acetylcysteine in paracetamol poisoning were directed by the MHRA with the aim of improving outcomes of patients, and they were intended

for immediate implementation. Our results show that less than two-thirds of a relevant cross-institutional population of multidisciplinary healthcare professionals were aware of the changes in the 12 weeks that followed their implementation date. Only half reported having adopted them in practice.

These data provide a useful case study in relation to the dissemination of an important, time-critical, practice-changing announcement from the medicines regulator to healthcare practitioners. Less than a quarter of respondents in our survey received the information directly from the regulator, and only 1% received the direct healthcare professional communication [3] (traditionally, the 'Dear Doctor letter'). By contrast, about three-quarters learnt of the changes through an internal alert or communication from another professional body (e.g. a specialty college). This is consistent with a cascade approach to information dissemination, which may be appropriate, particularly when an institution needs to supplement regulatory information with local implementation instructions. However, the absence of a clear channel of communication from the medicines regulator to healthcare professionals inevitably limits its capacity to induce an immediate change in practice.

We identified a small mismatch between the proportion of respondents who were aware of the changes and those who had adopted them in practice. Although our data do not permit us to characterize the reasons for this, it is notable that individuals who changed their practice were significantly more likely to have received practical implementation instructions, such as a local protocol or guideline. We know that the five main institutions

Figure 1

Overall awareness of changes to the management pathway for paracetamol poisoning, sources of information and the effects on the respondents' practice. Percentages are calculated using the number of individuals flowing into the box as the denominator. Abbreviations are as follows: BNF, British National Formulary; CHM, Commission on Human Medicines; MHRA, Medicines and Healthcare Products Regulatory Agency; NPIS, National Poisons Information Service; SPC, Summary of Product Characteristics; TOXBASE, clinical toxicology database of the National Poisons Information Service. *This proportion differed significantly between the groups reporting that they did, and did not, change their practice in response to the guidance changes ($P < 0.001$)

providing respondents to this survey had formally adopted the new treatment pathway prior to dissemination of the survey invitation; therefore, it seems likely that this discrepancy reflects individual rather than institutional resistance to change practice, which is possibly attributable to a lack of practical guidance.

Our findings are consistent with other data indicating that medicines safety information from the regulator is not always reliably translated into practice. For example, the safety warnings issued by the MHRA in 2005 concerning the antipsychotics risperidone and olanzapine had little impact on prescribing practices [5]. By contrast, those issued regarding the cardiovascular risk of nonsteroidal anti-inflammatory drugs had a more marked effect on practice, which may have been attributable to the accompanying media coverage [5]. Likewise, in a systematic review of the impact of drug risk communications from the US Food and Drug Administration, their effect was found to be variable, and often minimal or delayed [6]. It was suggested that the effectiveness of risk communication is greatest when the messages are specific, where

acceptable alternative treatment strategies are available, and when the messages are reinforced over time [6]. In line with these principles, our results suggest that the provision of practical implementation instructions (e.g. a protocol) may be important. The distinguishing feature of the communication under study here was its time-critical nature. The regulator clearly intended, appropriately, to induce a rapid, wholesale practice change, due to the risks associated with having two treatment pathways in concurrent use.

Strengths of this study include the relatively large sample, drawn from a relevant, multidisciplinary, cross-institutional population, representing the healthcare professionals who would implement the changes in practice. An important limitation is its susceptibility to selection bias, because we do not know the total number of individuals invited to participate in the survey who chose not to respond, nor their characteristics. However, it is useful to note that the awareness level observed in the paper-based pilot exercise, in which the response rate was known to be high (86%), did not differ significantly from that observed

following electronic administration. A further consideration is social desirability bias, but we judge that this factor is unlikely to have played an important role, because the survey was anonymous, and clearly described as such to participants. In order to keep the survey concise and straightforward, we sought only binary responses to questions concerning awareness and implementation. We cannot comment, therefore, on the extent to which respondents' knowledge of the changes may have been partial or inaccurate. However, we regarded the fact that individuals were aware of the existence of a change – whether or not they knew its precise details – as important and clinically relevant, because this would dictate whether they knew of the need to seek further information when they next encountered a case of paracetamol poisoning. We describe individual respondents' reports of whether they had adopted the new treatment pathway in practice. Self-reported data concerning practice changes must be interpreted cautiously. However, given that most respondents were drawn from institutions that had implemented the changes, the number of individuals reporting that they had not changed their personal practice tends to suggest communication barriers. Finally, as the survey was conducted in the 12 week period following the implementation date, it should be viewed as a 'snapshot in time', which does not reflect ongoing awareness levels. However, it was the intention of the regulator that the changes should be adopted immediately, to avoid having two treatment pathways in concurrent use. Consequently, an assessment of the awareness of relevant professionals in the immediate postimplementation period is informative.

In conclusion, we found that changes to the treatment pathway for paracetamol poisoning, a common and potentially serious condition, were incompletely disseminated to and implemented by healthcare professionals. Our data suggest that the provision of practical, supporting materials may be important in inducing a practice change. The findings presented here are consistent with other data concerning the implementation of safety warnings from medicines regulators. Taken together, the data reveal a need to improve the lines of communication between the medicines regulator and individual healthcare practitioners who will implement their advice. We suggest that this would be amenable to study by means of randomized controlled trials, as is increasingly being applied in other areas of UK public policy [7].

Competing Interests

All authors have completed the Unified Competing Interest form at http://www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and

declare no support from any organization for the submitted work. P.I.D. and D.M.W. have previously received funding from McNeil Pharmaceuticals for a study related to paracetamol availability in the UK. P.I.D. has acted as an expert adviser to McNeil Pharmaceuticals and the US Food and Drug Administration (FDA) on paracetamol (acetaminophen) poisoning. A.W.H. is a member of an MHRA advisory committee; this is not remunerated.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Appendix S1 Survey tool