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ORIGINAL RESEARCH ARTICLE

Relevance of Foreign Alerts and Newsletters for the Medication Errors Reporting Programme in The Netherlands: An Explorative Retrospective Study

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Abstract

Introduction National reporting programmes usually collect and analyse medication error reports from healthcare providers in their own country and only disseminate guidance to healthcare providers within the borders of their country. It is unclear how much different national programmes could learn from each other. The aim of this study was therefore to explore to what extent alerts and newsletters about medication errors issued in other countries could also be relevant for the Netherlands.

Methods Ninety disseminated information items that had been issued by three national programmes (Canada, the US and the UK) in the period from June 2009 until June 2012 were collected. These items were compared with the national reporting programme Central Medication Incidents Registration (CMR-NL) in The Netherlands. Each selected item was subsequently assessed independently with six assessment criteria: is the medicine available in the Netherlands? If so, could a similar error occur in the Netherlands? Did the CMR-NL reporting programme receive any reports about a comparable (or even identical) error? If so, did these reports include any errors with serious temporary or permanent harm? Did the CMR-NL disseminate output about it?; If so, what was the dissemination date of CMR-NL?

Results From the 90 items, 87.8 % ($n = 79$) were relevant for Dutch healthcare. For 43 of the 90 items (47.8 %), the CMR-NL had received comparable (or even identical) errors but had not disseminated any alert or newsletter about these errors. The CMR-NL had disseminated an alert or newsletter for 14 of the 90 items (15.6 %).

Conclusion This study showed for a broad range of errors that the Dutch national reporting programme could learn from the three reporting programmes in Canada, the US and the UK. National reporting programmes can benefit from sharing alerts and newsletters that enhance the learning between countries.

Key Points

This is the first study to explore to what extent alerts and newsletters about medication errors issued in one country could be relevant for other countries.

National reporting programmes for medication errors would be well advised to screen the newsletters and alerts of other national reporting programmes.

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1 Introduction

In the last two decades, patient safety has become an important issue for healthcare providers. There are several strategies and policies for improving the safety of patients [1, 2]. The Institute of Medicine in the US encouraged healthcare providers to participate in error reporting systems in the report 'To err is human: building a safer health system' [3]. The US Institute for Safe Medication Practice (ISMP) was the first medication safety agency to set up a national reporting programme for medication errors in 1975 [4]. Many other countries have followed since then [4–9].

National reporting programmes usually collect and analyse reports from healthcare providers in their own country and only disseminate guidance to healthcare providers within the borders of their country. The rationale of a national reporting programme is that it helps to reduce medication errors by sharing reported errors through various dissemination channels and by providing guidance to healthcare providers on how to prevent or reduce these mistakes in practice. Although they share similar goals, systematic exchange of information between similar programmes in different countries is lacking. Yet, exchanging this information may very well expand the learning possibilities. At this moment, it is unclear how much national programmes could learn from each other. The primary aim of this study is therefore to explore to what extent alerts and newsletters about medication errors issued in one country could be relevant for other countries. More specifically, we compared the output (disseminated information items: alerts and newsletters) from three major national programmes (ISMP-Canada, ISMP-US, National Reporting and Learning Service in the UK [NRLS-UK]) with the input (reported medication errors) and output (disseminated information items: alerts and newsletters) of the Dutch national reporting programme (Central Medication Incidents Registration, CMR-NL). The secondary aim was to describe the characteristics of the reporting programmes that were included.

2 Method

2.1 Data Sources

A brief questionnaire was sent by email to the four national reporting programmes (CMR-NL, ISMP-US, ISMP-Canada, NRLS-UK) to collect the basic characteristics of the reporting programmes (see electronic supplementary material A for questionnaire). The questionnaires were sent back by email. The researchers also collected the number of reports that the CMR-NL was receiving from 2006 to September 2013.

2.2 Collecting Disseminated Information Items

For this study, one researcher (KC) collected 90 disseminated information items (in the rest of this article designated as 'items') that had been disseminated by three national reporting programmes (30 items from ISMP-Canada, 30 from ISMP-US and 30 from NRLS-UK) in the period from June 2009 until June 2012. The number of 30 items per programme was chosen in order to render analysis feasible within the time available for the research. For each reporting programme, the researcher started with the latest published item (in June 2012) and then worked his way backwards in time until the 30 drug-related items per reporting programme had been collected. These items included alerts, subjects in newsletters or data reports, guidance, and signals which were presented on the website of the reporting programme. The inclusion criterion was that the item described an error which was related either to medication or to a device necessary to administer medication. The items from ISMP-Canada were taken from the ISMP Canada Safety Bulletins, which were available on the website http://www.ismp-canada.org/ISMPCSafetyBulletins.htm. The items from ISMP-US were selected from its biweekly newsletter 'ISMP Medication Safety Alert! Acute Care'. These newsletters were only available with a subscription and for this study ISMP-US sent them to the researcher on request. Many types of ISMP-US newsletters (acute care, community care, nurse advice, long-term care and consumers) are available, but for this research the newsletter for acute care was used, because this was the oldest (original) type of newsletter of ISMP-US. The NRLS-UK published the items on the website of the National Health System: http://www.nrls.npsa.nhs.uk/resources/patient-safety-topics/medication-safety/. The NRLS-UK publishes all kinds of items on the website, such as alerts, guidance, data reports and signals.

2.3 The Netherlands Central Medication Incidents Registration (CMR-NL)

The CMR-NL publishes alerts and newsletters on its website (www.medicatieveiligheid.info). Two researchers (KC and AR) independently compared the disseminated CMR-NL alerts and CMR-NL newsletters separately with each set of items that had been collected from ISMP-Canada, ISMP-US, and NRLS-UK. For the comparison, the researchers read the published CMR-NL Alerts, CMR-NL newsletters and the 90 items which contained basic information about the nature of the medication error including underlying causes. The researchers looked for

medication errors with a similar medication or device necessary to administer a medicine, a comparable (or even identical) nature of error and comparable underlying cause(s). For this study, all alerts and newsletters were considered to be potentially relevant, because we were interested to find out what CMR-NL could have learnt from other countries. We explored all output items (alerts and newsletters) since the establishment of CMR-NL from January 2006 up to and including September 2013. In this period, the CMR-NL disseminated 19 alerts and 129 items in 10 newsletters.

The two researchers also searched independently in the database of CMR-NL for reports about medication errors that were comparable with the ones presented in the collected items from ISMP-Canada, ISMP-US, and NRLS-UK. The researchers used the above-mentioned aspects to search for comparable medication errors in the CMR-NL database. These reports had been sent by hospitals and community pharmacies to the CMR-NL reporting programme from January 2006 up to and including September 2013 [4].

2.4 Analysis

For each item of ISMP-Canada, ISMP-US and NRLS-UK, one of the researchers (KC) documented the date of dissemination. When the item was a repetition of an item published earlier, the researcher looked for the original publication (including the original dissemination date). Each selected item was subsequently assessed independently by two researchers (KC and AR), who are both pharmacists with several years of experience in the evaluation of CMR-NL reports. Each independently answered the following six assessment criteria for each item: is the medicine available in The Netherlands? If so, could a similar error occur in The Netherlands? Did the CMR-NL reporting programme receive any reports about a comparable (or even identical) error? If so, did these reports include any errors with serious temporary harm, serious permanent harm or death? Did the CMR-NL disseminate output about it? If so, what was the dissemination date of CMR-NL? For the first assessment criteria, the researchers used the website of the Dutch medicine evaluation board to check if a medicine was registered for sale in the Netherlands. For the second assessment criteria, both researchers have worked in pharmacy practice and could draw from this professional experience to decide if a process can occur in the Netherlands or not. They subsequently came together to compare their results and to reach consensus. For each disagreement, the two researchers discussed the item and the results that they found. A third researcher was available to solve remaining disagreements.

3 Results

Electronic supplementary material B presents the basic characteristics of the four reporting programmes in table format. The earliest reporting programme was set up in the US in 1975. The other reporting programmes started in the past 15 years. The ISMP-Canada and CMR-NL only collect medication errors, whereas the NRLS-UK registers all kinds of errors concerning patient accidents, treatment/procedure, access/admission/transfer/discharge, and infrastructure. The ISMP-US collects medication errors, device errors and hazardous conditions. All kinds of healthcare providers can report to ISMP-Canada, ISMP-US and NRLS-UK. The NRLS-UK receives confidential reports of patient safety errors from healthcare staff across England and Wales.

In the period from January 2006 up to and including September 2013, the CMR-NL received 55,490 medication errors. Healthcare providers working in community pharmacies submitted 9,093 (16.4 %) errors and those in hospitals submitted 46,397 (83.6 %) errors.

In the period going back from June 2012 to June 2009, ISMP-Canada disseminated 22 safety bulletins, ISMP-US sent out 76 'ISMP Medication Safety Alert! Acute Care' newsletters, and NRLS-UK published 39 items (e.g., alerts, guidance, data reports and signals) on its website. For this study, ISMP-Canada published 30 relevant items (news items in the safety bulletins) in a period of 28 months. ISMP-US issued 30 relevant items (news items in the Acute Care newsletter) in 4 months, and NRLS-UK (alerts, guidance, data reports and signals published on their website) published the 30 relevant items in 29 months. ISMP-US had by far the highest dissemination frequency and the largest number of disseminated items in the period from June 2012 to June 2009.

Figure 1 presents the distribution of 90 items (derived from ISMP-Canada, ISMP-US and NRLS-UK) over the six assessment criteria. The third researcher was not necessary to solve disagreements, as both researchers eventually reached consensus for all 90 items. Ten comparable items had been disseminated twice by different national reporting programmes. ISMP-Canada and ISMP-US had three comparable items. ISMP-Canada and NRLS-UK had four comparable items and ISMP-US and NRLS-UK had three comparable items. In three of these ten comparable items, the national reporting programme explicitly referred to output of another national reporting programme.

3.1 Could the Error Occur in the Netherlands

From the 90 items, 87.8 % ($n = 79$) were relevant for Dutch healthcare, but ten comparable items had been disseminated twice by different national reporting programmes. Thus,

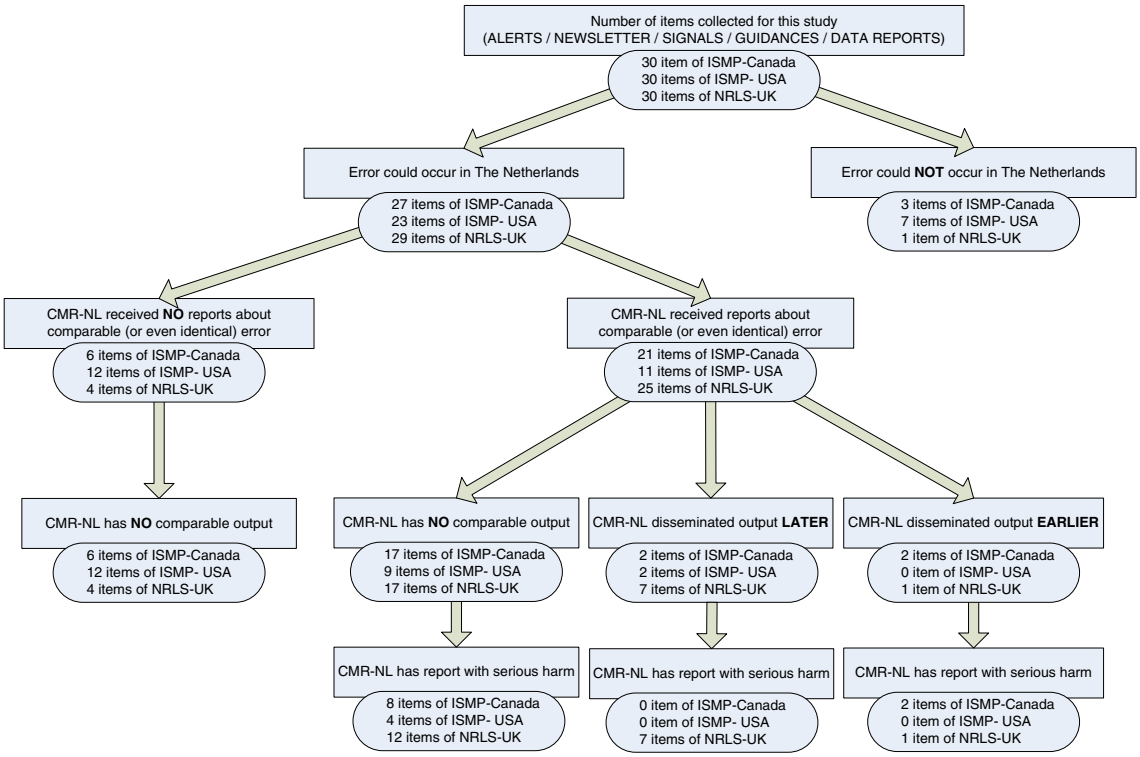

Fig. 1 Overview of learning from items from ISMP-Canada, ISMP-US, and NRLS-UK. *CMR-NL* Central Medication Incidents Registration-Netherlands, *ISMP-Canada* Institute for Safe Medication Practice-Canada, *ISMP-US* Institute for Safe Medication Practice-US, *NRLS-UK* National Reporting and Learning System-UK

69 unique items were relevant for Dutch healthcare. Only three of 30 ISMP-Canada items were not relevant for healthcare providers in the Netherlands. An example of an item that was not relevant for Dutch healthcare was a mix-up between two different strengths of warfarin to facilitate titration of doses; warfarin is not available in the Netherlands. From the 30 items of ISMP-US, 76.7 % ($n = 23$) could have occurred in the Netherlands. An example of an item that could not have occurred in the Netherlands was a mix-up between propofol and bupivacaine, because in the US both medicines are a milky white emulsion used in the operating room. In the Netherlands this could not have occurred because the bupivacaine product approved by the Dutch Medicines Evaluation Board is a clear solution. One item of NRLS-UK could not have occurred in the Netherlands. This item was about mismatching spinal, epidural and regional devices with incompatible connectors.

3.2 Comparable Errors of CMR-NL

In the period from January 2006 up to and including September 2013, 22 items (24.4 % of all 90 items; 31.9 % of 69 relevant items) had not been reported to CMR-NL. For 43 items (47.8 % of all 90 items; 62.3 % of 69 relevant items), the CMR-NL had received comparable (or even identical) errors but had not disseminated any alert or newsletter. Of these 43 items, the CMR-NL had received 24 reports with at least serious temporary harm (eight items from ISMP-Canada, four items from ISMP-US and 12 items from NRLS-UK). Nevertheless, the CMR-NL had not responded to these reports with any output (alert or newsletter).

3.3 Comparable Items in Different National Reporting Programmes

The CMR-NL disseminated an alert or newsletter for 14 of the 90 items (15.6 %) of ISMP-Canada, ISMP-US and NRLS-UK. Table 1 provides a few examples of these 14 items. Taking the dissemination dates into consideration, the CMR-NL could have learned from two items from ISMP-Canada, two items from ISMP-US and seven items from NRLS-UK. All these items (78.6 %, 11/14) were also disseminated by CMR-NL, but the items were disseminated many months earlier by ISMP-Canada, ISMP-US and NRLS-UK. ISMP-Canada disseminated the two items 20 and 18.5 months earlier than CMR-NL, respectively. The two items from ISMP-US were disseminated 117 and 27 months earlier, respectively. The seven items from NRLS-UK were disseminated 4–36 months earlier than CMR-NL. Conversely, our study showed that ISMP-Canada and NRLS-UK could have benefited from three

Table 1 Examples of items from both CMR-NL and another national reporting programme

	CMR-NL disseminated output later than	CMR-NL disseminated output earlier than
ISMP-Canada	In Canada and the Netherlands patients were administered insulin although these patients did not need insulin. ISMP-Canada sent out a safety bulletin in August 2010 and CMR-NL sent out a newsletter about errors with insulin in March 2012	In 2008 (September and December) the CMR-NL disseminated two alerts about erroneous exchange of the two formulations of amphotericin B (Fungizone® and AmBisome®). ISMP-Canada mentioned this error in its safety bulletin of April 2011
ISMP-US	In hospitals, patients who needed insulin were sharing the same pre-filled insulin pen. There was risk of blood-borne pathogen transmission, even when the needle was changed. ISMP-US sent out a newsletter in May 2012, but this was a repetition and the original message had been disseminated in March 2008. CMR-NL informed Dutch healthcare providers in a June 2010 newsletter	No comparable items were disseminated earlier by CMR-NL in comparison with ISMP-US
NRLS-UK	The use of loading doses of medicines can be complex and error prone. NRLS-UK received all kinds of errors related to loading doses and sent out an alert in November 2010. CMR-NL disseminated a newsletter in March 2011 after receiving several errors	In October and November 2006, CMR-NL sent out two alerts about methotrexate dosages of once a day instead of once a week. In September 2009, CMR-NL worked out a list of recommendations for oral anti-cancer medicines, including methotrexate. NRLS-UK published guidance about anti-cancer medicines in October 2010

CMR-NL Central Medication Incidents Registration-Netherlands, *ISMP-Canada* Institute for Safe Medication Practice-Canada, *ISMP-US* Institute for Safe Medication Practice-US, *NRLS-UK* National Reporting and Learning System-UK

different items from the CMR-NL. For two items from ISMP-Canada, the CMR-NL had disseminated these items 8 and 31 months earlier. CMR-NL had disseminated one comparable item 47 months earlier than NRLS-UK.

4 Discussion

This is the first study to explore to what extent alerts and newsletters about medication errors issued in one country could be relevant for other countries. Our study showed for a broad range of errors that the Dutch national reporting programme could learn from similar programmes abroad. Furthermore, this study indicated that, conversely, ISMP-Canada and NRLS-UK could have benefitted from the CMR-NL. We also saw that not all alerts and newsletters were relevant for the Dutch healthcare setting, because the range of registered and marketed drugs (including over-the-counter drugs) is different between countries. Some alerts or newsletters were disseminated twice by different national reporting programmes so the net yield of relevant items was 69 instead of 79 items. CMR-NL did not always disseminate concrete output even though sister reporting programmes had disseminated guidance and even when it had received comparable (or even identical) error reports. Why CMR-NL did not disseminate any output about these medication errors still needs to be explored in a follow-up study. The research group has handed over all relevant items to CMR-NL.

Only three items that were published twice by the three different national reporting programmes explicitly referred to output of another national reporting programme. This raises the question of how systematically they take such information into account. Our study shows that in several instances alerts had been disseminated earlier by one system than by another, implying that the latter system could have benefited from the earlier alert. During the course of our study, it became clear that several EU countries had issued a similar alert about the risk of overdosing the anticancer drug cabazitaxel due to insufficient clarity about the appropriate method of reconstitution in its Summary of Product Characteristics. ISMP-Spain already disseminated an alert about this problem mid-2012, but the CMR-NL did not send out such an alert until September 2013 and UK professionals were only warned in October 2013 [10–12].

4.1 Strengths and Limitations

A strength of this study is that the analysis was structured (by means of six assessment criteria) and was carried out independently by two researchers, who both had hands-on experience with the analysis of CMR-NL error reports. Another strength is that the study assessed items from three different national reporting programmes for comparison with the CMR-NL. The sampling of the 90 items from these three reporting programmes was sufficient to cover a diversity of errors.

A limitation is that we only investigated systematically what and how much the CMR-NL could learn from the items from three national reporting programmes (Canada, the UK and the US) and not the other way around. Yet we found that some items had been disseminated months earlier by the CMR-NL. It would be interesting to investigate more systematically what ISMP-Canada, ISMP-US

and NRLS-UK could have learnt from the output of CMR-NL.

In this study we only investigated the ISMP-US output through 'ISMP Medication Safety Alert! Acute Care' newsletters, because this was the oldest (original) output channel of ISMP-US. The ISMP-US has four other newsletters, namely Community Care, Nurse Advice, Long-Term Care and Consumers. It is therefore possible that the total number of useful items could be higher and that we could have missed items. On the other hand, our analysis of the 30 selected ISMP-US items seemed sufficient to assess whether learning from this type of newsletter could be advantageous.

The sampling method used (starting with the latest published item and working back in time) may have affected our results, as—depending on the frequency of dissemination of published items—this implies that different time windows were studied for the different reporting systems. For feasibility reasons, we collected 30 items per programme (90 items in total). Furthermore, only one researcher collected the 90 items and this could interfere with the inclusion of the items. This is most likely to result in an underestimation of what reporting systems can learn from each other. A final limitation was related to the questionnaire that was used to collect basic characteristics of the four national reporting programmes. The questionnaire was not validated, but we assumed that this would have a minimal effect because the questions and answers were straightforward (see electronic supplementary material A for questionnaire).

4.2 Implications for Practice

National reporting programmes would be well advised to screen not only the reports they receive from individual healthcare providers, but also the newsletters and alerts of other national reporting programmes. Learning from other countries may also be an attractive option for countries which do not yet have an operational national reporting programme for medication errors. Of course, several practical barriers need to be overcome in order to realize these suggestions, for example, non-English speaking countries need to translate their alerts (and, if achievable, also their newsletters) into English. Other potential barriers are the various methods national reporting programmes use to disseminate the warnings to healthcare providers and differences in error taxonomies and definitions.

Each national reporting programme could subscribe to all the different alerts and newsletters from other national reporting programmes, but probably the screening would become very time consuming. A more efficient solution would be if a central supranational organisation (such as the European Medicine Agency, the World Health Organisation, or the International Medication Safety Network [IMSN]) would collect and select alerts and newsletters for international distribution. The European Medicine Agency has an action plan to develop guidance about data sharing between national patient safety authorities and national regulators by September 2015 [13].

Potential selection criteria should be based on the assessment criteria of this study plus our three basic criteria for the relevance of the error: (i) risk of recurrence; (ii) educational potential for other healthcare providers; and (iii) actual or potential risk of serious harm to the patient [4].

Besides sharing data between national reporting programmes, it is important to take into account the timely dissemination of feedback on medication errors to healthcare providers in practice. Benn et al. [14] suggested that feedback is effective when the information is timely and consists of corrective actions. The feedback should also be disseminated to a large group of healthcare providers to raise awareness.

The exchange of data may also benefit systematic data collection, through audit and research. This may in turn drive the patient safety agenda in countries, which may be another valuable result of learning from each other.

4.3 Implication for Research

This study provides insight into the potential relevance of exchanging items between national reporting programmes. Future research should also include the other four types of newsletter of ISMP-US (community care, nurse advice, long-term care and consumers). In addition, some national reporting programmes also disseminate annual reports, guidelines, etc., and this kind of output should also be investigated. The efficiency should be evaluated as well by comparing the additional yield of this approach with the extra time and effort it requires.

Our study only compared the content of disseminated items without evaluating and comparing the specific ways in which national reporting programmes analyse and process the medication errors received. More insight into these underlying methods might also have an educative effect on other centres. Another interesting point to investigate is the association between the disseminated items and the type of medications (high alert medication, hospital or primary care, etc.), and in which phase of the medication process the medication errors occur.

The current study investigated what the CMR-NL could learn from ISMP-Canada, ISMP-US and NRLS-UK. Our study suggests that it is also worthwhile to perform a vice-versa analysis of items in the future. Finally, it will be necessary to investigate how large numbers of alerts and

newsletters can be assessed most effectively and efficiently for dissemination to different healthcare settings.

5 Conclusion

Reports from healthcare providers are not only useful for patient safety in one country. The Dutch national reporting programme could learn from the three reporting programmes in Canada, US and UK. In total, 69 unique items (76.7 %) of the 90 explored items were relevant for Dutch healthcare. Furthermore, this study indicated that these three national medication errors reporting programmes could have benefitted from the Dutch national medication errors reporting programme. National reporting programmes would be well advised to screen the newsletters and alerts of other foreign national reporting programmes. The current study only investigated how much CMR-NL could learn from the three national reporting programmes. Considering the indication that the three national reporting programmes could learn from CMR-NL, it would be worthwhile to perform a vice-versa analysis of items. Future research should also focus on the usefulness of the other output of the reporting programmes, including the four types of ISMP-US newsletters. Insight is necessary about how the national reporting programmes analyse and process the medication errors that they receive. Clarifying these methods may have an educative effect on other national reporting programmes.

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Authors contributions For this manuscript, all authors have substantially contributed to the conception and design, or analysis and interpretation of data, drafting the article or revising it critically for important intellectual content and final approval of the version to be published.

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