

**NSW  
TAG**

# **Optimising timely access to life-saving drugs across NSW, the ACT and beyond**

February 2017

NSW  
Therapeutic  
Advisory  
Group Inc.

Advancing  
quality use  
of medicines  
in NSW

NSW TAG is an initiative of NSW clinical pharmacologists and pharmacists. For further information, contact New South Wales Therapeutic Advisory Group Inc. NSW TAG is funded by NSW Health.

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## Executive Summary

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Life-saving drugs (LSDs) are antidotes, antivenoms and other drugs that may treat infrequent and potentially fatal illnesses. The NSW Therapeutic Advisory Group (NSW TAG) has managed a Life-Saving Drug Register (LSDR) for NSW and ACT public hospitals since 1999. It is updated annually and is publically available on the NSW TAG website. The register provides indicative stock levels as well as facility contact information, and is utilised by NSW/ACT health staff and Poisons Information Centres across Australia.

NSW and ACT hospitals keep variable amounts of LSDs depending on the facility's status within the health system and local needs. Timely availability of LSDs is essential for optimal patient outcomes, however many are infrequently used. This presents unique challenges with regard to their stocking. In 2014, a survey of NSW and ACT public hospitals was conducted to assist NSW TAG to understand the issues faced by hospitals managing LSDs. The survey sought to understand cost, waste, and management issues and identify possible solutions or potential areas for improvement.

Challenges related to stocking LSDs are not unique to NSW, ACT or Australian hospitals.<sup>1-7</sup> Five specific challenges identified by our survey of NSW and ACT hospitals were:

1. There is a knowledge gap for decision making and lack of local policies with regard to the stocking of LSDs;
2. There is no real time access to pharmacy stock management systems to provide information on LSD stock holdings across NSW (and the ACT);
3. High costs are associated with stocking LSDs with frequent wastage reported due to short expiry and low usage;
4. There is no formal state-wide policy or arrangement that facilitates the sharing of LSDs between NSW hospitals (and across state borders); and
5. Stocking and supply of non-registered LSDs is problematic, due to complicated Special Access Scheme (SAS) procurement and documentation processes.

Variable antidote and antivenom stock holdings in NSW and ACT hospitals have the potential to impact on patient outcomes and unnecessary expenditure. With regard to optimising the logistics of LSD procurement and supply in NSW and the ACT, NSW TAG proposes the following recommendations:

1. Implementation of state and local risk management strategies for the stocking of LSDs, including the development of guidelines that inform inventory levels and enables sharing of antidotes and antivenoms between hospitals
2. Development of a web-based solution that improves access to and presentation of information relating to antidote and antivenom stock holdings in NSW hospitals and by retrieval services.
3. Inclusion of LSDs not currently listed in the Australian Register of Therapeutic Goods (ARTG) in a category of products that are eligible for automatic approval under the SAS.

These solutions are not necessarily confined to one state or territory, and therefore the development of a national framework for the procurement and supply of LSDs could potentially provide better outcomes for patients Australia-wide. Inter-jurisdictional cooperation is now required to realise these desired outcomes.

## Background

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The NSW Therapeutic Advisory Group (NSW TAG) has managed a Life-Saving Drug Register (LSDR) for NSW and ACT public hospitals since 1999. For the purposes of the LSDR, life-saving drugs (LSDs) are antidotes, antivenoms and other drugs that may treat infrequent and potentially fatal illnesses (such as hereditary angioedema) that would not be normally stocked as formulary items. NSW and ACT hospitals keep variable amounts of LSDs depending on the facility's status within the health system and local needs. The register does not mandate the LSDs that should be stocked by each hospital. Each hospital is expected to evaluate their requirements for LSDs and stock accordingly. The LSDR is not exclusive and hospitals may stock other LSDs that are not listed in the register. The LSDR is publically available on the NSW TAG website and is updated on an annual basis. The LSDR register can be accessed via the following link: <http://www.ciap.health.nsw.gov.au/nswtag/pages/life-saving-drugs-register.html>.

## Aims

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The main purpose of the March 2014 LSDR Survey was to:

- update indicative stock holding information of LSDs, specifically antidotes, in NSW and ACT public hospitals,
- document their location within the hospital and
- ensure hospital contact details were up-to-date

Stock holdings of LSDs could then be shared with other hospitals within NSW and the ACT, and additionally with Poisons Information Centres across Australia.

In addition, the March 2014 LSDR Survey included a number of questions to assist NSW TAG to:

- understand the issues faced by hospitals managing LSDs;
- identify cost, waste, and management issues; and
- identify possible solutions or potential areas for improvement.

This report provides a summary of the information obtained for this latter section of the survey.

## Methods

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A survey of 70 questions for online administration was devised:

- Eleven mandatory questions related to hospital demographics including name, size, location, case mix and responsible drug and therapeutic committee (DTC); resources e.g. access to a toxicologist; details of the respondent; and, in-hours and after-hours contact details for LSDs enquiries.
- Nine mandatory questions related to the presence of local policy governing LSDs stock holdings and acquisition, and the process of reviewing requirements, including frequency of review, clinicians involved and assessment of local hazards.
- Six non-mandatory questions related to annual cost associated with stocking LSDs, issues related to their stocking or acquisition and suggestions to improve their management and to reduce waste.
- The remaining forty-three questions related to stock holdings of thirty-one antidotes and other LSDs, nine of which are available in a number of different presentations or strengths. Hospitals were requested to provide stock levels of a LSD in up to three hospital locations where the most stock was carried. LSDs were listed as those that should be immediately available (in these cases, it is recommended that the stock be kept in or near to the Emergency Department) or available within four hours of requirement. Two final questions requested information about stock levels of two drugs previously listed in the LSDR but now allocated to second line therapy for acute calcium channel blocker poisoning and acute beta-blocker poisoning, calcium chloride injection and intravenous bolus glucagon, respectively. Requirements to treat a 70kg adult in the first 24 hours were provided to participants.

After consultation with stakeholders such as the Chief Pharmacist, NSW Ministry of Health, the survey was pilot tested by two NSW hospitals to ensure clarity. Survey Monkey™ was used to collect the data. Potential participants were identified using the index from the previous LSDR, the NSW TAG address book and by contact with Local Health District pharmacists or Directors of Pharmacy. An invitation email to participate in the survey was sent to hospitals in NSW and the ACT. Email invitations were repeated if no response was received. Follow up also occurred if incomplete responses were received.

## Results

The survey was sent to 189 hospitals in NSW and 2 hospitals in the ACT. These ranged from large tertiary hospitals with large pharmacy departments that managed LSDs stock, to small remote hospitals where a nurse or facility manager managed the stock. A total of 123 NSW and ACT public hospitals completed the LSDR survey (64% response rate). Six hospitals provided two responses, and these were combined to provide one response per hospital.

Two of the respondent hospitals did not stock antidotes. These were small hospitals/multi- purpose services located in regional or remote NSW.

Responses were received from all NSW LHDs and the ACT as displayed in Table 1.

**Table 1: Respondent NSW and ACT hospitals according to Local Health District/Network or Jurisdiction, n=123**

NSW Local Health District/Network or Jurisdiction	Number of hospitals (%)
Western NSW	30 (24%)
Hunter New England	27 (22%)
Murrumbidgee	11 (9%)
Southern NSW	11 (9%)
Northern NSW	8 (7%)
Northern Sydney	5 (4%)
South Western Sydney	5 (4%)
Illawarra Shoalhaven	4 (3%)
Nepean Blue Mountains	4 (3%)
South Eastern Sydney	4 (3%)
Western Sydney	3 (2%)
Far West NSW	2 (2%)
Mid North Coast	2 (2%)
Sydney	2 (2%)
ACT	2 (2%)
Central Coast	1 (1%)
St Vincent's Health	1 (1%)
Sydney Children's Hospital Network	1 (1%)
<b>TOTAL</b>	<b>123 (100%)</b>

## Respondents

The vast majority of respondents were pharmacists (86%). Other respondents included facility managers (10%), nurse managers (3%) and one pharmacy store manager (1%). The categorisation of the facilities that provided responses is shown in Table 2.

**Table 2: Categorisation of responding facilities, n=123**

Hospital type	Number of hospitals (%)
Small remote hospital without a full or part-time on-site pharmacist	34 (28%)
Small regional hospital (<2,000 acute separations/year) without a full or part-time on-site pharmacist	21 (17%)
Medium, metropolitan or regional hospital (>2,000 acute separations/year)	19 (15%)
Small regional hospital (<2,000 acute separations/year) with a full or part-time on-site pharmacist	14 (11%)
Large regional hospital (8,000 – 16,000 separations/year)	14 (11%)
Principal referral hospital	8 (7%)
Large major metropolitan hospital (10,000 – 20,000 separations/year)	5 (4%)
Subacute and non-acute hospital	4 (3%)
Small remote hospital with a full or part-time on-site pharmacist	2 (2%)
Specialist women's hospital	1 (1%)
Specialist paediatric hospital	1 (1%)

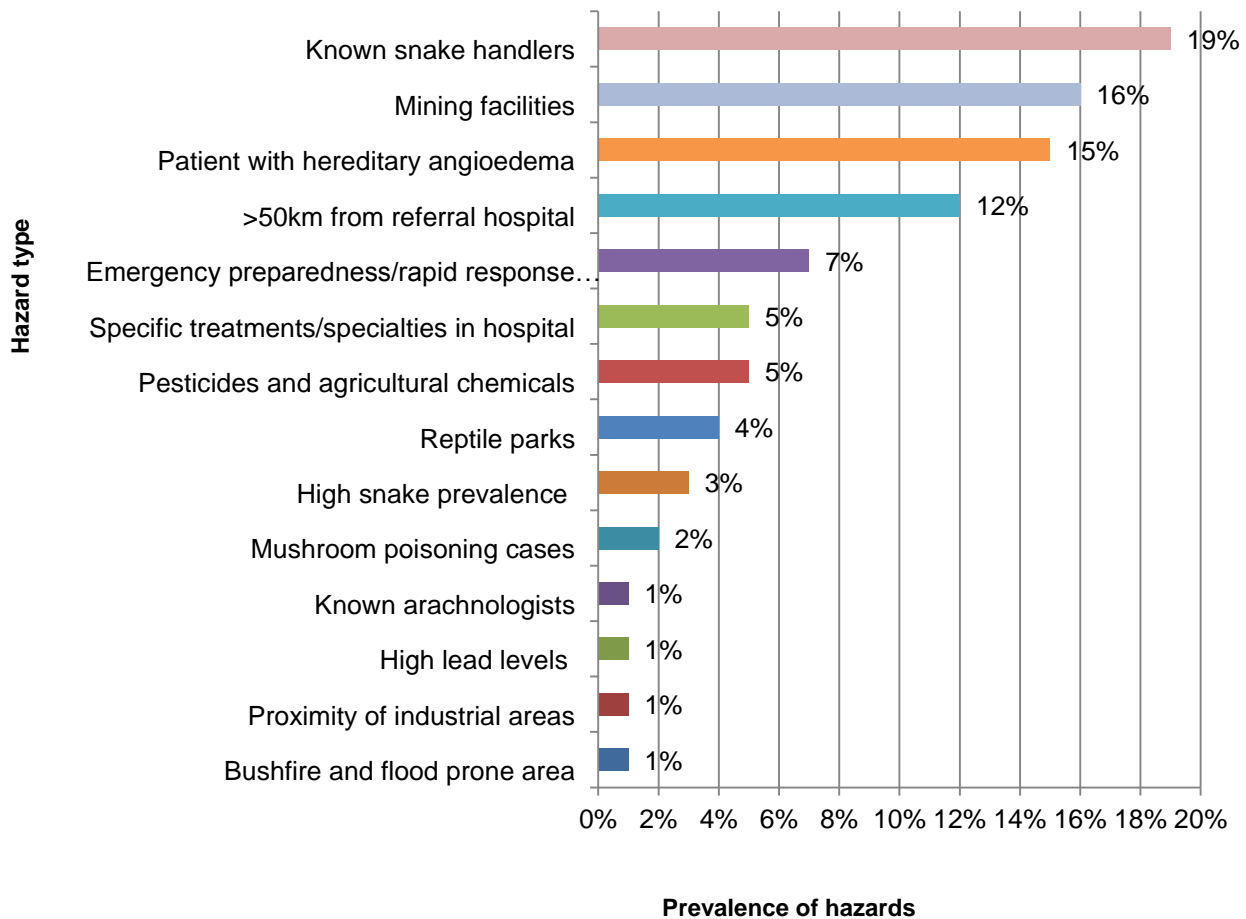


## Access to toxicologist and awareness of toxicological hazards (n=123)

A small number of respondents (5%) reported having access to an on-site toxicologist, while a further 39% of respondents reported having access to a toxicologist at an affiliated site. The remaining 56% of respondents reported having no access to a toxicologist.

Respondents were asked to indicate the prevalence of known 'out-of-the-ordinary' hazards within the hospital service area which influence the stocking of LSDs. More than one response was possible. The prevalence of known local hazards reported is shown in Figure 1.

**Figure 1: Prevalence of known hazards within the hospital service area**

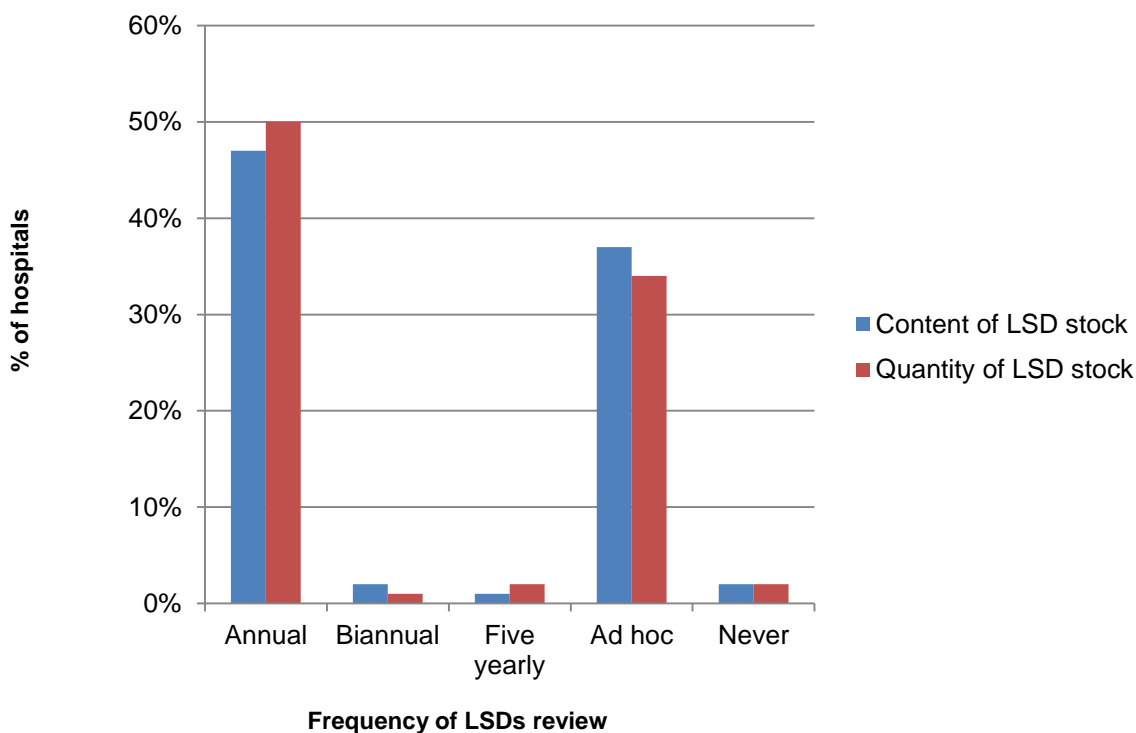


## Frequency of reviews

Approximately half of the respondents indicated that the specific LSDs to be stocked by their hospital, as well as the quantities required to be stocked, were reviewed annually by those responsible. Approximately one third indicated that reviews occurred on an ad-hoc basis. A small number of respondents indicated that LSD stock reviews were undertaken on biannual or five yearly bases (approximately 2% respectively). There was no indication of a review timeframe reported by approximately 8% of respondents.

The frequency of LSDs review, broken down by those required to be stocked and the level of stock held is shown in Figure 2.

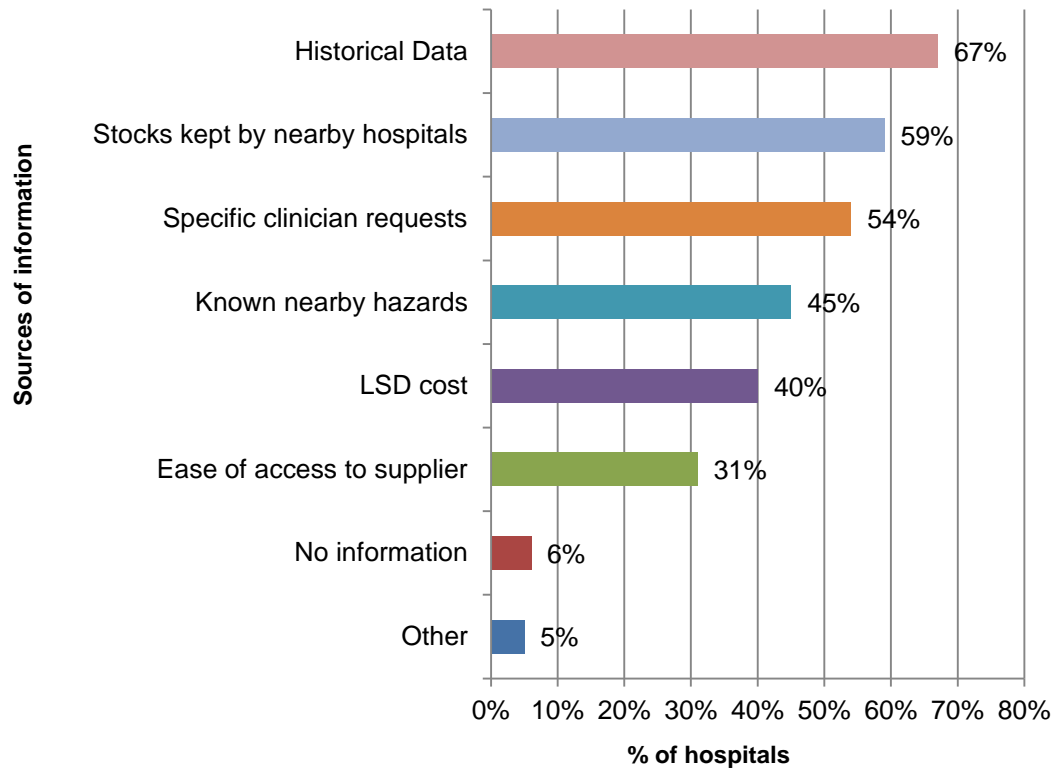
**Figure 2: Frequency of LSDs reviews by hospitals, n=123**



## Rationale applied in LSDs reviews

Respondents were asked to indicate the sources of information they used to evaluate risk and inform the review of LSDs stock holdings. More than one answer was possible. Responses are summarised in Figure 3.

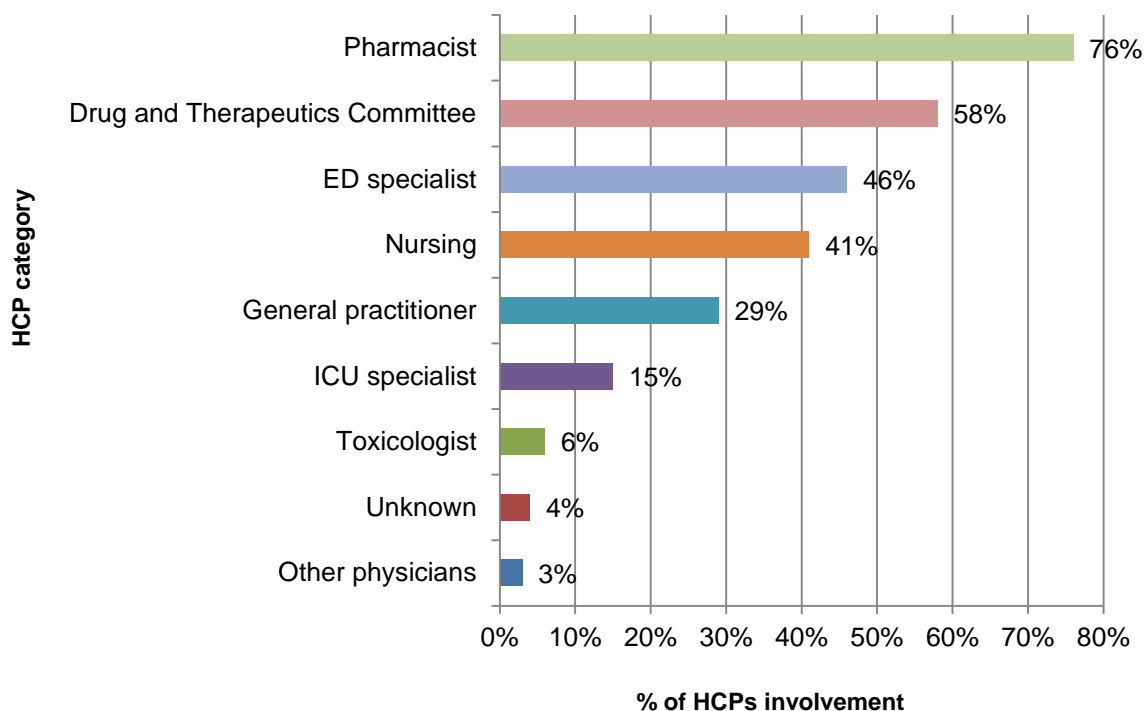
**Figure 3: Sources of information used to inform LSDs stock holdings**



## Involvement of healthcare professionals in LSDs reviews

Respondents were asked to indicate the healthcare professionals involved in the review of LSDs at their facility. More than one response could be provided. The majority of respondents reported that a pharmacist and/or the Drug and Therapeutics Committee were involved in the review of LSDs holdings (76% and 58% of hospitals respectively). The responses are summarised in Figure 4.

**Figure 4: Healthcare professionals (HCPs) involved in the review of LSDs stock holdings**



## Local policy for the management of LSDs

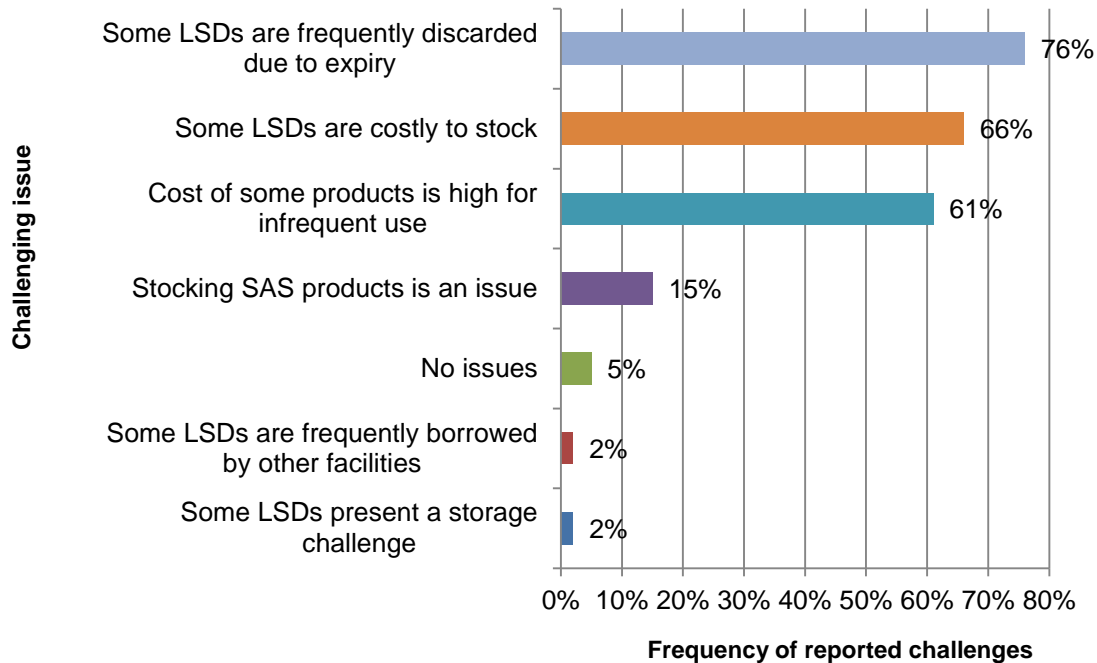
Respondents were asked if there were documented local policies for the management of LSDs. Only 11% reported having a documented local formulary policy, however 17% reported having a documented policy that described how lifesaving drugs could be accessed from other hospitals or suppliers.

Respondents were also asked to indicate if there was co-ordination within their LHD with regard to specific LSDs stocked and quantities held. The majority (66%) indicated that there was co-ordination within their LHD with regard to the stocking of LSDs.

## Challenges with LSDs management

Examples of possible challenges faced by facilities with regard to the stocking of LSDs were provided in the survey. Respondents were asked to indicate if these were relevant to their facility. More than one answer could be provided, and responses are collated in Figure 5.

**Figure 5: Challenges with stocking LSDs**



Free-text responses regarding challenges faced were also provided by respondents. The stocking of antivenoms was identified as particularly problematic, with 18% of respondents reporting antivenom expiry as a specific issue, while 14% reported the cost of antivenom was a specific issue. Other free-text responses describing specific challenges included:

- A lack of consensus between health professionals regarding the need to stock specific LSDs, despite certain risks being evident in the hospital service area;
- The potential need to procure high cost LSDs from overseas due to local unavailability (e.g. fomepizole and dehydrated alcohol for toxic alcohol poisonings);
- The need to stock a regular supply of certain LSDs so that treatment may be initiated in a timely manner (e.g. glucarpidase, icatibant);
- The unavailability of doctors to administer LSDs at smaller hospitals; and
- Infrequent requests for LSDs from other hospitals.

Respondents were also asked whether obtaining LSDs within the recommended time for initiation of treatment was problematic. A minority of respondents (7%) reported this being an issue.

## Suggestions to improve the management of LSDs

Suggestions to improve the current management of LSDs were sought, to increase effectiveness and efficiency while minimising wastage. Two suggestions were provided in the survey for consideration and free-text responses were also allowed. Developing service agreements for the rapid supply of LSDs was favoured by 41% of respondents, while developing better supply chain systems (e.g. real time IT capability) was favoured by approximately one third of respondents (36%). Other free-text responses provided included:

- Real time access to LSDs stock holdings across the state is required, to eliminate the current process of phoning multiple hospitals to locate and obtain them in an emergency. Liaison with wholesalers to provide real time information on current LSDs stock holdings (Special Access Scheme stock in particular) is also required.
- Wholesalers should keep LSDs in stock, and those infrequently requested should not be procured by wholesalers on a 'buy in' basis.
- There should be state-wide policy directive/agreement regarding access to LSDs across NSW hospitals without costs incurred for lending or borrowing.
- A cost analysis of LSDs wastage should be undertaken.
- Local processes around store quantities and sharing of LSDs between sites within a LHD should be formalised. Larger sites and base hospitals should adopt a policy of rotating stock within the LHD to reduce wastage (e.g. within six months of expiry).
- A register of LSDs expiry dates from companies could facilitate a more proactive approach to management of replacement stock. That is, to prevent gaps in the supply chain that occur when replacement stock is ordered but it is subsequently unavailable for supply.
- An appropriate courier service that is reliable and that can invoice the requestor is required.
- Continued liaison with pharmacists is essential. The management of LSDs at smaller hospitals would be improved by having an on-site pharmacist or by having regular (rather than ad-hoc) visits from a pharmacist.

## Discussion

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Challenges related to stocking LSDs are not unique to NSW, ACT or Australian hospitals. A 2010 survey of antidote availability in Queensland hospitals found that few hospitals held sufficient stock or could acquire stock within the recommended time frame for administration.<sup>1</sup> Inadequate antidote stocking in Lebanon, Pakistan, New Zealand, the United States of America, the United Kingdom and Malaysia has been reported in the literature over the past five years.<sup>2-7</sup>

Specific challenges identified in our survey of NSW and ACT hospitals can be summarised as follows:

1. There is a knowledge gap for decision making and lack of local policies with regard to the stocking of LSDs;
2. There is no real time access to pharmacy stock management systems to provide information on LSDs stock holdings across NSW (and the ACT);
3. High costs are associated with stocking LSDs, with frequent wastage reported (due to short expiry and low usage);
4. There is no formal state-wide policy or arrangement that facilitates the sharing of LSDs between NSW hospitals (and across state borders); and
5. Stocking and supply of non-registered LSDs is problematic, due to complicated SAS procurement and documentation processes.

Approximately two thirds of invited hospitals (123/191, 64%) responded to the survey. A large proportion of these responding hospitals (55/123, 45%) were small regional or remote hospitals without a full or part-time pharmacist on-site, which may signify a greater need for support with regard to the appropriate stocking of LSDs. Conversely, principal referral hospitals provided less than 10% of the responses (8/123, 7%). These respondents represented approximately half of all principal referral hospitals across NSW and the ACT (8/14, 57%).

### Decision support for LSDs stock holdings in NSW and ACT Hospitals

The survey results reflect an inconsistent approach to the management of LSDs by individual hospitals and LHDs in NSW and the ACT. While the majority of hospitals (58%) reported the involvement of a Drug and Therapeutics Committee (DTC) in a facility review of stock holding requirements, only half of the responding hospitals undertook these reviews annually, and around a third of responding hospitals undertook these reviews on an ad-hoc basis. Further to this, only a small proportion of respondent hospitals (10%) had a written local formulary policy with regard to stocking LSDs.

Most commonly, a multi-disciplinary team was involved in a facility review of LSDs requirements, and the majority of hospitals used historical data, stock held by neighbouring hospitals and specific clinician requests to inform stock holdings. However, less than half of responding hospitals (45%) used known nearby hazards to inform stock holdings, and it was unclear as to whether all potential hazards were considered, as the reported prevalence of some hazards (e.g. pesticides/agricultural chemicals; industrial areas; bushfire and flood prone areas) appeared lower than expected.

Confusion regarding the accessibility of local clinical toxicology advice was also apparent. Approximately half of the respondents (56%) reported having no access to a clinical toxicologist. Some of these responding hospitals were within LHDs that have established clinical toxicology units. Additionally, all NSW and ACT public hospitals can consult a clinical toxicologist via the NSW Poisons Information Centre. In this respect, resources provided by clinical toxicology units and poisons information services are potentially under-utilised.

Variable antidote and antivenom stock holdings in NSW and ACT hospitals have the potential to impact on patient outcomes and unnecessary expenditure. Availability and stocking of LSDs should be informed by current and evidence-based guidelines; epidemiology of poisoning/envenomation presentations and locally available clinical resources (including retrieval services). At present, there are no guidelines for antidote stock management in NSW or ACT hospitals. NSW TAG has managed the LSDR for NSW and ACT hospitals over the past fifteen years, and has observed a higher turnover of staff responsible for stocking LSDs at regional and remote sites that do not have an on-

site pharmacist. Knowledge of local hazards, risks and clinical resources required for appropriate stocking of LSDs at these facilities is likely lost as a turnover.

There are, however, guidelines for the treatment of snake and spider bites in NSW Hospitals, with recommendations for the stocking of antivenoms.<sup>8</sup> Adherence to these guidelines has been measured against the NSW TAG 2015 LSDR antivenom survey responses, and although 73% of hospitals were compliant, there was significant overstocking in half of the compliant hospitals. This translational gap could be attributable to lack of awareness regarding the true incidence of snake bite envenomation requiring treatment with antivenom in NSW and ACT hospitals, and results in unrealised savings for the state.

Implementation of national, state-wide and local risk management strategies that inform LSDs inventory levels and enable sharing of antidotes and antivenoms between hospitals is crucial for optimal patient outcomes. National and/or state guidelines are difficult to produce due to diversity of local population hazards and hospital administrative barriers. Whilst there is collaboration within Australia with regard to many aspects of clinical toxicology, steps towards a national approach with respect to stocks and supply of antidotes and antivenoms have not been successful, probably due, in part, to the federated system of secondary and tertiary healthcare. The lack of a national framework makes coordination between health services difficult. It is also of note that management of toxicology cases are not limited by state borders, and that many border hospitals may be closer to hospitals in another state than a hospital within their NSW LHD or another nearby LHD. Additionally, the clinical capability of individual hospitals (i.e. hospitals that stabilise and refer patients versus those that provide tertiary care) should inform the supra-regional availability of some LSDs such as antidotes.

## **Access to information on LSD stock holdings across NSW and ACT**

NSW/ACT, VIC, WA and SA have varying forms of publically available/internet based registers of LSDs to facilitate the identification of sites stocking individual LSDs. The lists are not standardised, and are maintained by labour-intensive annual surveys of individual hospitals. Currently there are no such registers in QLD, TAS or the NT. The effort required to maintain the NSW/ACT LSDR on an annual basis is currently measured in months. Approximately one third (66/191, 35%) of NSW/ACT hospitals did not respond to this survey. This suggests that the LSDs stock information not captured across NSW is significant. As previously mentioned, there appears to be a high turnover of staff in regional and remote facilities, which further impedes the data collection process, as contact lists for survey invitations are difficult to maintain.

Sourcing LSDs by clinical staff is sometimes measured in hours. Approximately one third of respondents (36%) indicated that real time information technology capability would assist in locating stock from other hospitals in an emergency. A systematic means of data collection is required to improve the timely access of LSDs across NSW and the ACT. Pharmacy stock inventory systems in NSW and ACT hospitals are not utilised or have not been developed to facilitate the location of LSDs stock holdings. NSW TAG, eHealth NSW and the NSW Poisons Information Centre have begun investigating the capability of the iPharmacy™ stock management system to provide this functionality. There is potential that a centralised iPharmacy data warehousing capability may provide an answer to real-time data accessibility. This would eliminate the need for many NSW hospitals to complete annual LSDR surveys, as facility stock levels could be captured automatically. Ideally the functionality should include barcode scanning to record product expiry to facilitate rotation of stock between sites, and the ability to detect product usage as opposed to product re-stocking. A limitation is that not all hospitals (e.g. those in the Hunter New England and Western Sydney LHDs) are able to provide the iPharmacy data required at present. Real time reporting of LSDs stock holdings may become possible if the full functionality of these systems are developed and prioritised. Data should be geographically mapped and presented in a user-friendly interface that indicates stock location and provides facility contact details. The potential to add facility information regarding other locally available clinical resources (e.g. diagnostic laboratory, ICU, dialysis, ECMO and liver transplant capabilities) should also be explored.



## High costs and frequent wastage associated with stocking LSDs

Approximately one third of respondents (34%) reported that the costs associated with stocking LSDs costs were a particular issue. This could potentially lead to suboptimal stocking and may impact the clinical management of patients. The cost for small facilities to stock LSDs was especially burdensome and some borrow from larger hospitals to reduce costs. A small number of hospitals did not stock some LSDs if they were considered too costly.

Antivenoms were specifically identified as a major costs burden by 14% of respondents. Other LSDs considered costly to stock were digoxin specific antibody fragment and SAS products, such as hydroxocobalamin and silbinin. Although not on the NSW TAG LSDR, specific comments were also made regarding the significant cost to hospitals associated with stocking dantrolene and tenectapase.

Low usage and subsequent expiry of LSDs is known to deter stocking.<sup>3</sup> Just under half of all survey respondents (43%) reported issues with expiry of LSDs, and only one local health district reported having instituted a rotating stock exchange system to reduce wastage and costs.

## Lack of formal policies for the coordination of LSDs in NSW and ACT Hospitals

Survey responses indicated that sharing stock of LSDs between facilities was generally a favoured option. Currently there are informal arrangements in place between hospitals. Suggestions to facilitate sharing of LSDs stock included the development of a state-wide policy, as well as LHD policies for rotation of stock between facilities.

Central storage and coordination of antidotes was suggested by one respondent, and this has been proposed by the World Health Organisation (WHO) as 'an economic and effective means of ensuring distribution, and this should be organized by health authorities in such a way that any poison victim may be assured of receiving an antidote within the appropriate period of time'.<sup>9</sup> However, logistical barriers in NSW such as geographical distance and lack of reliable couriers may be insurmountable. Also, the cost of antidotes and of the wastage caused by expiry must be compared with the cost of transport in emergencies.

Strategic stocking of LSDs that are not required to be immediately available should be facilitated across NSW hospitals. The NSW TAG LSDR has identified products that must be immediately available or available within 4 hours. However, other LSDs such as desferrioxamine for the treatment of iron toxicity and succimer for the treatment of lead poisoning are examples that could be stocked regionally. Moreover, dosing regimens of some LSDs, such as digoxin specific antibody fragment may vary depending on whether the poisoning is chronic or acute.<sup>10</sup> A study by Chan et.al found that one or two vials of digoxin-specific antibody administered in chronic digoxin toxicity appears to be sufficient to decrease free digoxin concentrations to zero.<sup>11</sup> A small number of patients experienced a subsequent rebound of free digoxin concentration, however this did not lead to worsening clinical effects and no further digoxin-specific antibody was required. Large initial doses of digoxin specific antibody fragment are currently recommended for acute digoxin toxicity; however these presentations are relatively rare. It is more common for digoxin specific antibody stock to be used for chronic digoxin toxicity, therefore it would be reasonable to stock two vials widely across NSW. Additionally, two vials of digoxin specific antibody fragment will usually be sufficient to maintain the patient with acute toxicity, while more stock can be obtained if required.

## Challenges associated with the management of non-registered LSDs

Survey respondents reported challenges with the procurement of non-registered LSDs and dissatisfaction with the documentation requirements associated with their use. Approximately 10% of hospitals provided suggestions for improvement, the majority of which related to simplifying the SAS documentation process and/or waiving of SAS designation for LSDs.

Currently, 13 of the LSDs on the NSW TAG LSDR (42%) must be obtained under the SAS. Many have more than one size, strength or brand and hospitals often need to accommodate these variations due to shortages, changes in manufacturer or wholesaler supplies. It is possible that a hospital will be required to stock a number of formulations in order to have the sufficient recommended dosage.

The 'Australian Government Response to the Review of Medicines and Medical Devices Regulation' accepted recommendations *'which will streamline access to medicines and medical devices not currently in the ARTG for individual patients, and minimise the need for health practitioners to repeatedly apply to the TGA for approval to supply certain lower-risk medicines and medical devices under the Special Access and Authorised Prescriber Schemes. Development of an online system also has the potential to reduce administrative costs for health practitioners, and enable better monitoring of the use of these products.'*<sup>12</sup> The inclusion of LSDs could potentially provide solutions to the challenges identified by our survey.

## Conclusions and Recommendations

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Variable antidote and antivenom stock holdings in NSW and ACT hospitals have the potential to impact on patient outcomes and unnecessary expenditure. Several challenges to LSDs stocking were identified by the survey and were not unexpected. However these challenges are not confined to one state or territory, and therefore the development of a national framework for the procurement and supply of LSDs would potentially provide the desired outcomes identified. Guidelines that provide current evidence-based recommendations for the use and administration of LSDs, as well as a method for predicting what stock and quantities should be held, are required to improve patient outcomes and reduce waste. Roll-out of guidelines should be accompanied by education at local LHD level, as well as dedicated resources for on-going review and evaluation of their effectiveness.

With regard to optimising the logistics of LSDs procurement and supply in NSW and the ACT, we propose the following recommendations:

1. Implementation of state and local risk management strategies for the stocking of LSDs, including the development of guidelines that inform inventory levels and enable sharing of antidotes and antivenoms between hospitals
2. Development of a web-based solution that improves access to and presentation of information relating to antidote and antivenom stock holdings in NSW hospitals and by retrieval services.
3. Inclusion of LSDs not currently listed in the ARTG in a category of products that are eligible for automatic approval under the SAS.

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