Title: Medical device regulation in Australia: safe and effective?

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Short title: Medical device regulation in Australia

Abstract

Objective: Medical devices are widely used to improve patient outcomes but may also be hazardous. Recent government reports have suggested reform of the Australian Therapeutic Goods Administration (TGA). We aimed to describe the frequency, characteristics and outcomes of reports of possible harms related to medical devices submitted to the TGA using data made publically available on the TGA website.

Design and setting: A retrospective analysis of data made publically available on the TGA website from January 2000 to December 2011 conducted in January 2012.

Main outcome measures: The number and nature of reports of medical device incidents, recalls and alerts.

Results: Up to December 2011, 6812 medical device incidents were reported to the TGA, although there were several time-periods where data was unavailable. Device incidents were reported more frequently in later years, most often by device sponsors and often attributed to mechanical problems. 295 deaths and 2357 serious injuries have been related to device incidents, with serious injury highest in 2009 (n=597). Most device incidents were not investigated (47.5%) or after investigation, no further action was taken (25.0%). During the same time-period, there were 35 medical device recalls and 34 medical device alerts issued by the TGA, with no consistent increase over time.

Conclusions: Despite TGA reform proposals, greater transparency is still needed. Unaddressed issues include patchy and conflicting data in the public domain and inexplicit rationale for the large proportions of uninvestigated reports. To maintain public confidence in the national regulatory system these issues need to be resolved.

Introduction

Medical devices are ubiquitous in healthcare and have the potential to create large-scale health gains, but also unintended harms through device failure. In the United States in 2006, medical devices were responsible for 2712 deaths.[1] The recall of DePuy Orthopaedics' (Warsaw, Indiana, USA) articular surface replacement hip prosthesis helped to highlight deficiencies in medical device regulation worldwide.[2, 3] Subsequent investigations in the United States showed that most high-risk medical devices were being approved through processes not designed to assess safety or efficacy.[4] Investigations into medical device regulatory processes in Europe were hampered by a lack of transparency and accountability.[1]

Medical device regulation is a complex and evolving area and recently a range of relevant reports and reform proposals relevant to the Australian Therapeutic Goods Administration (TGA) have been put forward. A Health Technology Assessment (HTA) tabled by the Department of Health and Ageing in December 2009 addressed "the regulatory burden on business that results from HTA processes".[5] After a consultation period, the TGA responded to this report in September 2011 by setting out proposals to reclassify joint replacement implants, amend the manner in which devices are included on the Australian Register of Therapeutic Goods (ARTG) and to increase the level of device product information available on the TGA website.[6] In July 2011, the Department of Health and Ageing released a review, which sought to improve the transparency of the TGA across a wide range of areas including market authorisation processes, post market monitoring and compliance, and improved stakeholder involvement in the TGA.[7] Subsequently in November 2011, the Senate Standing Committees on Community Affairs released a report into the regulatory standards for the

approval of medical devices in Australia, which made reference to most of the previous reports.[8] In addition, this report made further recommendations relating to the recalled DePuy Orthopaedics' articular surface replacement hip prosthesis, inducements paid by device companies to clinicians, improved reporting of adverse events by clinicians and the importation of medical devices over the internet, amongst others.[8] Finally, in December 2011, the TGA issued a document outlining their proposed response to these reports, of which some changes related to medical devices.[9]

We aimed to investigate the frequency, characteristics and outcomes of reports of possible harms related to medical devices, from the Australian perspective, using data made publically available on the TGA website.

Methods

Data sources

We only used publicly available sources of data, that is, information provided by the ARTG (https://www.ebs.tga.gov.au/ebs/ANZTPAR/PublicWeb.nsf/cuDevices?OpenView) and information on medical device incidents provided by the TGA website (http://www.tga.gov.au/index.htm, accessed 24th January 2012). We did not utilise information contained in medical device bulletins because they are not publicly accessible (only Australian health professionals currently working in a healthcare facility are allowed to subscribe after their application is approved by the TGA) and their use requires the permission of the TGA. Ethical approval was not required for this study as it made use of publicly available data. All data extraction was conducted independently by RGM and TER with consensus agreement.

Number of medical devices

The ARTG provides information on therapeutic goods that may be legally supplied in Australia. Each entry in the ARTG provides information on one or more medical device(s), with variants of a device occupying a single entry, for example, two different sized hip replacements may occupy the one entry. Each entry listed on the ARTG is classified by manufacturers and the TGA into risk categories based on a series of algorithms.[10] For example, low risk devices include non-sterile dressings, low-medium risk devices include contact lenses, medium-high risk devices include infant incubators and high-risk devices include permanent pacemakers. We used the ARTG website to determine the number and type of entries listed, which we used as a proxy for the number of medical devices available

on the Australian market. Due to the design of the ARTG website with the potential for multiple devices within one entry, we were unable to count the true number of devices.

Reports of medical device incidents

If a problem occurs with a medical device, it may be reported to the TGA. The TGA website provides information on the frequency and characteristics of received medical device incident reports. We analysed all publicly available medical device incident data from January 2000 to December 2011 to determine the number, source, cause, and reported effect of medical device incidents.

Response of TGA to reports of medical device incidents

The TGA may decide not to investigate an incident if further investigation is deemed not necessary at that time, or after investigation they may decide that no further action is necessary. On the other hand, if a medical device needs to be removed from the Australian market for reasons relating to quality, efficacy or safety, the TGA will issue a device recall. If the TGA wish to provide information or recommendations about a device such as the outcome of an investigation, a medical device alert may be issued, which does not necessarily indicate that a product is unsafe. Using the TGA website, we analysed all publicly available data from January 2000 to December 2011 to determine the outcome of medical device incident investigations.

Results

Number of medical devices

There were 36 635 entries listed on the ARTG. Most of these were low risk (17 780 or 48.5%), 10 815 (29.5%) were registered as low-medium risk, 4 981 (13.6%) were registered as medium-high risk and 3 059 (8.3%) were registered as high-risk. From the available data, we were unable to determine how many entries were added per year or how many unsuccessful medical device applications had been made to the TGA.

Reports of medical device incidents

Medical device incident statistics were unavailable for the following periods: January 2000 to October 2000, June 2002 to December 2002, June 2003 to December 2003, June 2004 to December 2004 and July 2009 to December 2011. In total 6812, medical device incidents were reported to the TGA over the past ten years and they have become more frequent over time, see **Table 1**. It is unknown how many reports refer to the same medical device, as these data were not provided.

There were 295 reported deaths related to device incidents, 2357 incidents associated with serious injury, 1542 incidents associated with temporary injury and 2616 incidents associated with no injury, see **Figure 1**. The number of serious injuries was highest in 2009 (n=597). Further information on what injuries were caused or how death occurred was unavailable on the website. The reported effect of device incidents was missing in two cases.

Device incidents were often attributed more than one cause, as 7644 causes were reported for 6812 device incidents. While the cause of medical device incidents was often unknown,

the second most commonly reported cause 'mechanical' (13.0%, 993/7644), sharply increased towards the end of the sample period, representing 32.8% (316/962) of all reports in 2009, see **Table 2**. Medical device sponsors reported the most incidents (56.5%, 3850/6812), see **Table 2**. The source of incident reports was missing in 10 cases.

Response of TGA to reports of medical device incidents

Device incidents were often attributed more than one outcome, as there were 7369 outcomes for 6812 device incidents. Most incident reports were either not investigated (47.5%, 3502/7369) or after investigation, no further action was taken (25.0%, 1841/7369). The proportion of incident reports not investigated also increased in later years from 40.3% (62/154) in 2001, to 59.5% (575/967) in 2009. Only 3.3% (241/7369) of reports resulted in a device recall or hazard alert and 2.5% (187/7369) of reports in a safety alert being issued. A device fault was unconfirmed for 3.7% (272/7369) of cases, see **Figure 2**. It is unknown how many incident reports were assigned more than one outcome, as these data were not provided.

There were 35 device recalls issued by the TGA, see **Table 1**. There was no consistent increase in the number of device recalls over time. Twelve of these recalls were considered high risk, as the device had the potential to be life threatening or cause a serious risk to health; for example 'Four Seasons Glow'n'dark Condoms' were recalled in 2003 because they failed to meet performance standards. Nineteen of these recalls were considered medium risk, as the device had the potential to cause illness or mistreatment for example 'INVACARE Action 2000 Wheelchairs' were recalled in 2009 because of a fault that may have caused occupants to fall from their wheelchair and sustain injuries. Four of these recalls were considered low risk, as the device did not pose a significant hazard to health, for

example ‘Dejour tampons’ were recalled in 2003 for failing to meet mandatory absorbency requirements.

Inconsistencies were found in the number of alerts issued by the TGA. An alphabetical list of all therapeutic alerts from January 2000 to December 2011 indicated there were 34 device related alerts. The same list sorted by date indicated there were 33 device alerts issued. We determined the true number of alerts by further comparing and crosschecking the complete lists sorted both alphabetically and by date. To determine the true number of alerts we made sure that each entry was only counted once. There were actually 34 unique device alerts issued, see **Table 1**. Device alerts did not consistently increase over time.

Discussion

Based on publicly available data, over the past decade, 6812 medical device incidents associated with 295 deaths and 2357 serious injuries have been reported to the TGA. Reporting of medical device incidents has become more frequent, but most reports are not investigated (47.5%) or after investigation, no further action is taken (25.0%). A device fault was only unconfirmed in 3.7% of all cases. In comparison, between January 2000 and December 2011 there were only 35 medical device recalls and 34 medical device alerts issued by the TGA with no apparent increase over time. Furthermore, publicly available data was often incomplete, inconsistent and insufficient to understand the assessment of the safety and efficacy of medical devices, with no data available since 2009.

Despite a series of reports urging transparency and reform, our investigations highlight a number of unaddressed issues. First, it is unclear why there are several periods where medical device incident data is unavailable, particularly as the number of serious injuries appeared to increase towards the end of 2009. In addition, the data provided on alerts was inconsistent. Second, it is unclear why so many incident reports were not investigated, while the proportion of unconfirmed device problems remained relatively constant. If these 'false alarms' remain constant, this implies that there may have been some validity to the incident report in the remaining cases although this cannot be determined because so many reports remain uninvestigated. Third, it is unclear what class of devices are being recalled. Current product recalls describe the level of risk presented by the device incident but not the device itself. Fourth, it is unclear why reports of medical device incidents are consistently increasing while device recalls are not. In total, 295 deaths related to device incidents were reported yet during a longer observational period, there were only 12 'high risk' medical

device recalls. Increasing reports may reflect an increased awareness of the need to report all adverse events amongst the community for example, through the establishment of the National Joint Replacement Registry. It may also reflect increased adherence of companies to their legal obligations to report all adverse events, under sections 41MP and 41MPA of the Therapeutic Goods Act 1989.[11]

On the other hand, as the TGA website is updated and other proposals are implemented, some issues are likely to be resolved. For example, the TGA have now proposed a plan of action to reform the way in which medical devices are included in the ARTG.[9] From July 2012, all ARTG entries for medical devices will need to include product name details. This will facilitate the generation of a list of all the medical devices available on the Australian market. In addition, there are proposals to provide greater levels of device product information on the TGA website.[9]

While we have chosen to analyse data publicly available from the TGA website, this has led to a number of limitations. The data on medical device recalls, alerts and notifications, is provided at a summary level and so more advanced statistical analysis is not possible because data on individual devices is not provided. We were unable to determine if the rise in medical device incident reports was a random variation or the beginning of an increasing trend because of the lack of up to date data. In addition, we have not examined medical device bulletins or asked the TGA to provide further information. This is because we wanted to maintain the perspective of the average healthcare worker or informed consumer attempting to assess the safety and efficacy of a medical device. Finally, we could not locate data on the number of voluntary recalls issued by device manufacturers or the number of people affected by a recall because this data was not made public by the TGA.

Clearly, the demands being placed on the TGA are changing over time and the TGA are responding to these changes. While our primary concerns centre around the transparency of available data, the various government reports and TGA proposals have sometimes focussed on other important but different issues, for example the reclassification of prosthetic devices. None of the reports released to date or the reforms proposed by the TGA address the issues we have raised, namely missing and conflicting data, the increasing proportion of uninvestigated reports and a lack of information about the type of medical devices being recalled. The Senate Standing Committees on Community Affairs report only reference to transparency is the recommendation that "the Government implements the recommendations of the Therapeutic Goods Administration Transparency Review in a timely manner". Of the 21 recommendations contained in the Department of Health and Ageing review on the transparency of the TGA, none specifically mentions medical devices and none address the issues raised in this paper. Nevertheless, the TGA's recently released blueprint for reform does contain some constructive proposals for example including more information about individual medical devices on the TGA website. These efforts will go some way towards increasing transparency and allow the public access to information to help them make informed decisions about the safety and effectiveness of any given device.

In conclusion, medical devices are widely used to improve patient outcomes, but based on publicly available data from the TGA it is difficult to make informed decisions about the safety of any given device. Although recent government reports and reform proposals have gone some way towards improving the regulation of medical devices and the accountability of the TGA, greater transparency is still needed. Given the large number of reported deaths and serious injuries reportedly caused by device failures, this remains an issue of serious

concern and further change is needed, so that public confidence in the regulatory system can be maintained.

Figure legends

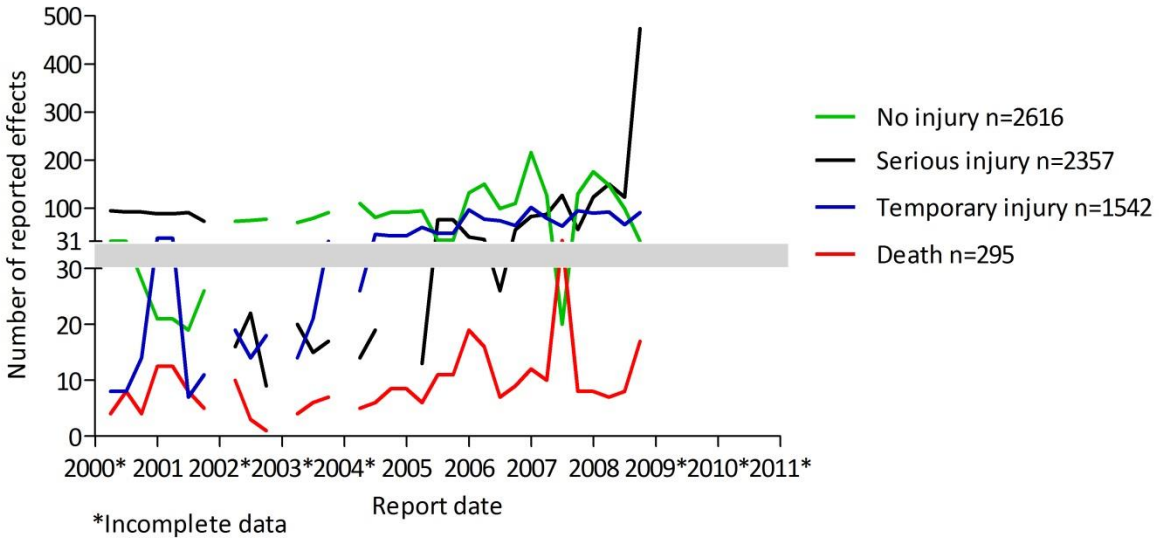
Figure 1: Reported effect of medical device incidents submitted to the TGA, as of January 2012

Figure 2: Outcomes of TGA investigations

[1]Not investigated: Every report receives a risk analysis and is discussed by a panel of technical and clinical professionals. In the case of reports that are "Not Investigated" the panel has made a decision that further investigation of the particular event is not necessary at that time.

[2]Other: Includes safety alerts, compliance testing, bulletin articles, referral to Good Manufacturing Practice, company warnings and surveillance.

Figures



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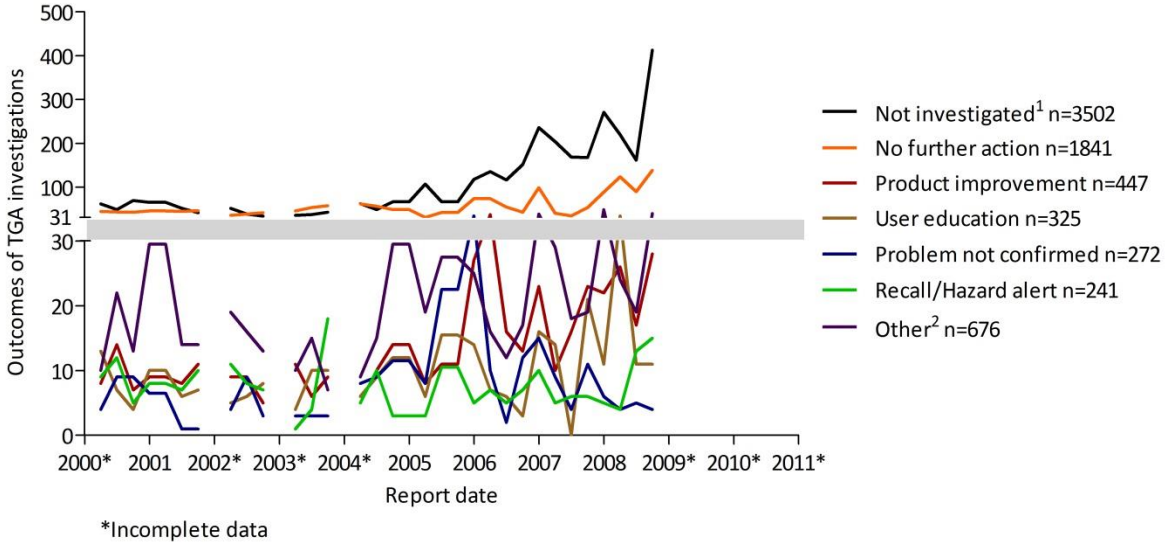

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Tables

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
All device recalls	0	1	1	4	0	0	5	1	9	1	2	5
All device alerts	0	1	0	0	0	1	0	0	8	2	5	8
Reports of medical device incidents	138*	585	358*	327*	422*	672	939	1129	1316	926*	-*	-*
Devices listed on ARTG†	-	-	-	-	-	-	-	-	-	-	-	36 635

Table 1: Number of medical device recalls, alerts and incident reports

* Data incomplete or missing for these years

†Australian Register of Therapeutic Goods

Table 2: The 10 most common sources of and reported causes of incident reports

	2000*	2001	2002 *	2003 *	2004 *	2005	2006	2007	2008	2009 *	2010 *	2011*	Totals
10 most common sources of incident reports													
Sponsor	44	149	94	93	183	322	515	771	979	700	-	-	3850
Nurse	22	87	52	32	30	71	62	79	79	65	-	-	579
Hospital supply service	13	79	53	26	48	46	54	67	52	11	-	-	449
Specialist	9	48	22	30	30	29	29	54	33	25	-	-	309
Biomedical engineer	6	35	27	17	12	27	41	34	39	25	-	-	263
Blood bank	12	64	15	45	28	17	22	17	7	0	-	-	227
Medical administrator	5	22	28	14	6	28	33	27	45	5	-	-	213
Overseas advice	5	30	12	11	27	52	44	5	6	1	-	-	193
Patient/User	6	8	4	0	0	0	14	35	17	17	-	-	101
Other	16	63	51	56	57	63	85	78	93	56	-	-	618
10 most common causes of device incidents													
Unknown	25	96	37	42	64	155	251	366	269	118	-	-	1423
Mechanical	4	25	20	23	37	37	50	102	379	316	-	-	993
Not device related	20	73	42	30	61	92	122	143	186	74	-	-	843
Component failure	26	123	77	59	89	115	114	55	54	43	-	-	755
Electrical	8	44	17	8	10	26	9	56	138	166	-	-	482
Manufacture	12	59	32	27	21	53	70	67	77	17	-	-	435
Material/ Formulation deficiency	16	80	51	57	38	34	36	38	48	33	-	-	431
Design	2	37	23	22	21	55	57	66	48	34	-	-	365
Wear/ Deterioration	6	20	15	6	13	22	35	55	39	15	-	-	226
Other	60	197	173	123	124	153	282	267	166	146	-	-	1691

* Data incomplete or missing for these years

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