THE USE OF INFOGRAPHICS, TABLES AND GRAPHS IN THE HOSPITALS AND HEALTH SERVICES QUALITY ACCOUNT IN AUSTRALIA

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ABSTRACT

OBJECTIVE: This study will investigate whether removing the Quality Accounts purpose and aim led to differences in the number of Infographics, Tables and Graphs used over four years.

DESIGN:
A content analysis was performed on the Quality Accounts of six Hospitals and Health Services from 2016 to 2019. Statistical analysis was then performed to examine differences in the use of Infographics, Tables and Graphs in the Quality Account

SETTING:
The six Hospitals and Health Services were operating in a rural geographical area in the state of Victoria, Australia.

RESULTS:
Even though some significant differences were found, this was largely due to yearly variability in the use of Infographics, Tables and Graphs. The six Hospitals were quite different in their Quality Account presentations because these reports are structured to a particular community.

CONCLUSIONS:
The removal of the purpose and aim has not affected the number of Infographics, Tables and Graphs. While limitations are noted, a number of future research opportunities stem from this study to enhance the Quality Account and overall understandability of Hospital reports.

KEYWORDS

Quality Account; Hospitals; Understandability; Infographics; Tables; Graphs; Management

INTRODUCTION

This paper examines how six rural Hospitals and Health Services (HHS) in Australia use Infographics, Tables and Graphs within their Quality Account. The Quality Account (formerly called a Quality of Care report) provides an annual snapshot of hospital operational performance information, including how quality and safety of care are measured and monitored [1]. In the Australian state of Victoria, all HHS are required to produce a yearly Quality Account based on government reporting guidelines and an Annual Report.

The release of hospital performance data to the general public aims to fulfil a healthcare provider's duty to disclose quality or performance information to the public, thereby increasing transparency and accountability of the healthcare system to its citizens [2] and improving the quality of care [3]. The Victorian Government [1] Quality Account reporting guidelines for HHS acknowledge the purpose is to provide accessible information about the service's quality of care and in doing so demonstrate the service's transparency and accountability and the aim is to meet diverse quality and safety health literacy needs by providing a report that is accessible and easy to understand.

In terms of health performance reporting, Islam [4] noted that adhering to high governance standards by implementing accountability for health service organisations can enhance the quality of health service delivery. Reporting systems, however, can often be complex, and the sector requires support with data reporting to make it easier to understand [3]. As a result, the Victorian Government's Quality Account guidelines [5] suggest the written content needs to be easy to read and understand for consumers, carers and the community. The Quality Account guidelines are structured to ask the community what specific content they would like to see and note that hospitals should think about how you can use images, graphs and graphic elements to help the community comprehend the report. Research has shown that accountability and transparency can be discharged by presenting information in a format that community members can easily understand. To this end, Infographics, Tables and Graphs can assist understandability because they convert complex technical data into information that is useful to stakeholders with little to no professional knowledge of the subject matter [6]. Healthcare performance management, visualisations, such as "emergency care" through charts and graphs, help administrators interpret performance and take appropriate actions [7].

The purpose of the Quality Account (to demonstrate transparency and accountability) and the aim (to provide information that is easy to understand) were outlined in the Victorian Government reporting guidelines from 2016 to 2018. In 2019, however, both the purpose and aim were excluded and not replaced. Given the request to consider the use of images, graphs and graphic elements, this study will investigate whether the exclusion of the purpose and aim led to differences in the number of Infographics, Tables and Graphs used in the Quality Account over the four years from 2016 to 2019, and particularly between 2018 and 2019.

Infographics, Tables and Graphs have been widely used to help users understand financial and non-financial information. In terms of infographics, Mindu et al. [8] explain that these are graphic visual representations of information, data or knowledge and that apart from being beautiful, engaging and easier to understand, ... also present complex information effectively. Research on the effects of infographics within publicly available reports has shown that these increase understandability [6] and uphold legitimacy [9]. Dunlap & Lowenthal [10] added that Infographics could deliver the maximum amount of content in the least amount of space while still being precise and clear. Hall [11] found that younger people preferred infographics, while Cox and De Goeij [6] noted that infographics are most effective for investors who lack literacy. Finally, Jahan et al. [12] found well-planned content within an infographic can lead to better understandability and increased dissemination of the key message.

In terms of graphs, previous research has examined and evaluated their use within publicly available reports. Courtis [13] for example, noted organisations use graphs to focus a 'reader's interest, attract and hold attention, facilitate understanding, save time in analysing data, help memory recall, highlight trends, clarify relationships and generally break down language barriers. Courtis [13] also stated that "the basic messages portrayed through a graph should be visually apparent and understandable to readers regardless of their educational or experience background". Frownfelter-Lohrke & Fulkerson [14] and Beattie [15] confirmed that graphs could assist report understandability, while Usmani et al. [16], noted that graphs assist readers to understand detailed information by giving a richer perspective of data, and this facilitates informed decision-making. Graphs can summarise data which assists readers to process information, and this saves time when analysing data [17,6].

Tables within publicly available reports can also facilitate understandability and improve disclosure quality [18]. The more frequent use of tables helps users of financial statements to understand and compare information quickly [19]. Tables can improve reader retention by clearly displaying statistical data [20] and can be used to emphasise symbolic information (numbers) and make information more understandable [21].

METHODS

Given the literature reviewed, the research question investigates whether removing the Quality Accounts purpose and aim led to differences in the number of Infographics, Tables and Graphs used over four years. The sample was restricted to Hospitals and Health Services operating in the rural geographical area of Gippsland in the state of Victoria, Australia. While some research exists in regional hospitals [22] very few studies have been undertaken in regard to the Quality Account [4], and in the Australian context. The six Shire Councils from where the Hospitals were drawn within Gippsland are shown in Figure 1.

FIGURE 1 - VICTORIA'S GIPPSLAND REGION

Source: Regional Development Victoria [23]

This study chose to examine one Hospital and Health Service from each Shire Council. The hospital chosen was that with the highest 2019 total income from transactions – a method that eliminated any perceived researcher bias [24,25].

The list of Hospitals and Health Services were Bass Coast Health (BCH), Bass Coast Shire; West Gippsland Healthcare Group (WGHG) Baw Baw Shire; Latrobe Regional Hospital (LRH) Latrobe Council; Gippsland Southern Health Service (GSHS) South Gippsland Shire; Bairnsdale Regional Health Service (BRHS) East Gippsland Shire, and Central Gippsland Health (CGH) Wellington Shire.

The Quality Accounts of the six HHS were identified and then downloaded from each website for four years to 2019. A content analysis was then used to individually count the number of Infographics, Tables and Graphs within the Quality Account. A consistent data coding framework was developed, which focused on clear definitions of Infographics [8], Tables [26] and Graphs [27], which ensured reliability [24,25]. Examples of Infographics (see Figure 2), Tables (see Figure 3) and Graphs (see Figure 4) are provided.

FIGURE 2 - INFOGRAPHIC EXAMPLE

(Source: Bass Coast Health [28])

FIGURE 3 - TABLE EXAMPLE

Victorian Healthcare Experience Survey (VHES) Results 2018 – 2019

Patient Experience	Q1 2018-19 (Jul-Sept)	Q2 2018-19 (Oct-Dec)	Q3 2018-19 (Jan-Mar)	Q4 2018-19 (Apr-Jun)
Overall positive patient experience (Target 95%)	97%	96%	90%	88%
Transition of care - patient discharge (Target 75%)	83%	80%	71%	80%
Perception of cleanliness (Target 70%)	74%	83%	73%	79%

FIGURE 4 - GRAPH EXAMPLES

RESULTS

Page Length

The Quality Accounts were colourful and contained staff and client pictures to make them vibrant and attractive. Because of the uniqueness of these reports to their communities, the documents varied in page length.

Figure 5 shows that a clear year on year pattern is not evident. BRHS and CGHS have similar page lengths, while GSHS had slightly more. BCH and WGHG generally increased year on year, whereas LRH decreased. The longest Quality Account was the LRH in 2019 (48 pages), while the least was BCH in 2016 (20 pages).

FIGURE 5 - QUALITY ACCOUNT – NUMBER OF PAGES (INCLUDING FRONT AND BACK COVERS) FOR SIX GIPPSLAND BASED HOSPITALS AND HEALTH SERVICES 2016 TO 2019

Quality Account analysis

Table 1 shows the total number of Infographics, Tables and Graphs used within the Quality Account over four years and the yearly mean. The results show that the yearly total number was highest in 2017 (113) and lowest in 2018 (79). Of the individual organisations, CGHS had the highest (94) and LRH the least (38).

A chi-square test examined whether the organisations consistently use Infographics, Tables and Graphs. Table 1 shows the p-value is 0.015, indicating a significant difference between how each organisation uses Infographics, Tables and Graphs. In terms of each organisation BCH, CGHS and 'BRHS's show variability over the years, while GSHS, WGHG and LRH show a downward trend in total numbers. The results also show that only BRHS and CGHS increased the use from 2018 to 2019. Over the four years, CGHS used the highest number (94).

Of importance to the study was whether the removal of the purpose and aim from the 2019 guidelines impacted the collective use of Infographics, Tables and Graphs. A chi-square test was conducted. Table 2 confirms no significant difference in the usage pattern for three organisations (LRH, GSHS & BRHS). BCH's p-value of 0.070 (between 0.05 to 0.10) indicates a weak statistical difference, while both WGHG & CGHS show a significant difference (p-value below 0.05). Upon further examination, CGHS's p-value (0.021) is because there is an unusual number in 2018 (where the total was only 11 - see Table 1) and does not indicate the usage altered in 2019. WGHG is showing the most significant statistical difference, yet Table 1 confirms the total usage is declining every year, and the change in 2019 may be due to this trend rather than the removal of the purpose and aim.

The communication tool used most in the Quality Account:

Analysis was undertaken on the separate use of Infographics, Tables and Graphs and the results in Table 3 shows there are more graphs (252, average 63) used compared to Infographics (72, average 18) and Tables (52, average 13). The total mean usage between 2018 and 2019 showed no real difference (13.17 in 2018 compared to 13.67 in 2019), which further substantiates that the removal of the purpose and aim in the 2019 guidelines did not impact the use of these communication tools.

TABLE 1 - QUALITY ACCOUNT TOTAL NUMBER OF INFOGRAPHICS, TABLES AND GRAPHS 2016 TO 2019

TOTAL NUMBER OF INFOGRAPHICS, TABLES AND GRAPHS WITHIN THE QUALITY ACCOUNT							
ORGANISATION	**2016**	**2017**	**2018**	**2019**	**4 YEAR TOTAL**	**MOVEMENT BETWEEN 2018 AND 2019**	**YEARLY MEAN**
Bass Coast Health (BCH)	14	28	26	16	**84**	**-10**	**21.00**
West Gippsland Healthcare Group (WGHG)	18	11	8	4	**41**	**-4**	**10.25**
Latrobe Regional Hospital (LRH)	14	9	8	7	**38**	**-1**	**9.50**
Gippsland Southern Health Service (GSHS)	13	12	11	5	**41**	**-6**	**10.25**
Bairnsdale Regional Health Service (BRHS)	19	24	15	20	**78**	**5**	**19.50**
Central Gippsland Health Service (CGHS)	24	29	11	30	**94**	**19**	**23.50**
Total	**102**	**113**	**79**	**82**	**376**	**3**	**94.00**
Two way P- value	0.015						

TABLE 2 - QUALITY ACCOUNT ONE-WAY CHI-SQUARE TEST RESULTS PER ORGANISATION, 2016 TO 2019

ORGANISATION	**QUALITY ACCOUNT CHI-SQUARE P-VALUE**
Bass Coast Health (BCH)	0.070
West Gippsland Healthcare Group (WGHG)	0.017
Latrobe Regional Hospital (LRH)	0.384
Gippsland Southern Health Service (GSHS)	0.286
Bairnsdale Regional Health Service (BRHS)	0.551
Central Gippsland Health Service (CGHS)	0.021

TABLE 3 - QUALITY ACCOUNT TOTAL HOSPITALS AND HEALTH SERVICES USE OF EACH COMMUNICATION TOOL

QUALITY ACCOUNT - TOTAL HOSPITAL AND HEALTH SERVICE USE OF EACH COMMUNICATION TOOL								
TYPE	2016	2017	2018	2019	TOTAL	YEARLY MEAN USAGE	2018 HHS MEAN USAGE	2019 HHS MEAN USAGE
Infographic	16	16	26	14	72	18.00	4.33	2.33
Table	11	16	12	13	52	13.00	2.00	2.17
Graph	75	81	41	55	252	63.00	6.83	9.17
Total	102	113	79	82	376	94.00	13.17	13.67

Analysis was then undertaken to determine if the usage of Infographics, Tables and Graphs had changed over the period. A one-way chi-square test was conducted. The results reported in Table 4 show that there is no statistical change in the use of Infographics and Tables. However, there was a change in the use of graphs (p = 0.001). The change in Graphs was largely due to yearly variability (refer to Table 3) because the number declined between 2017 (81) and 2018 (41) then increased in 2019 (55).

TABLE 4 - QUALITY ACCOUNT ONE-WAY CHI-SQUARE TEST RESULTS PER COMMUNICATION TOOL FROM 2016 TO 2019

COMMUNICATION TOOL	P-VALUE
Infographic	0.180
Table	0.783
Graph	0.001

DISCUSSION

The objective of this study was to examine whether the removal of the purpose and aim from the 2019 Quality Account guidelines had an impact on how six Gippsland Hospitals and Health Services used Infographics, Tables and Graphs. There has been a desire for HHS to consider the use of Images, Graphs and Graphic elements to engage readers and demonstrate accountability and transparency [5].

Results found that the change in 2019 guideline wording has not influenced the use of Infographics, Tables and Graphs between 2018 to 2019, and this was confirmed in Tables 1 and 2. Any movement was attributable to yearly fluctuations naturally occurring, and this can be seen clearly in CGSH, which increased the total number of Infographics, Tables and Graphs in 2019 (from 11 to 30) to previous levels in 2016 and 2017. The one-way chi-square test (Table 4) again indicates no statistical change in the use of Infographics and Tables, and while there is a significant change in the use of Graphs, this is because of natural fluctuations.

Infographics, Tables and Graphs can assist understandability because they convert complex technical data into information that is useful to stakeholders with little professional knowledge [6, 31]. Because each HHS is operating in a different geographical area, and the Victorian Government [5] Quality Account guidelines request the HHS ask the community what content they would like to see, it was anticipated that each Quality Account would be unique.

The individual count of Infographics, Tables and Graphs within the Quality Account shows that HHS prefers to use graphs. Previous literature has recommended that graphs better show overall trends and patterns [32]. Graphs are highlighted in the reporting guidelines because they show operational trends, performance against targets and outcomes [5]. As the Quality Account is written and distributed among the community to all stakeholders regardless of age, gender, education and background, graphs may be preferred because these groups can better comprehend the 'HHS' information without engaging professional advice [13,16].

CONCLUSION

The principal finding of this study is that removing the Quality Accounts purpose and aim in 2019 did not lead to differences in the number of Infographics, Tables and Graphs used over between 2018 to 2019. The research has also highlighted that HHS use Infographics, Tables or Graphs in large numbers to explain performance data. An implication is that in the future, regulators may need to consider creating a framework and further guidelines

around how these communication tools can be used within the Quality Account to further enhance understandability.

A further implication is that while prior research has found that Infographics, Tables and Graphs assist understanding (6,7,10,13], graphs are more widely used in this instance. The management of HHS may use this research to embed more graphs in their Quality Accounts. Infographics are a newer way of presenting data, and these could also become more utilised in future Quality Accounts.

Why the Victorian Government removed the purpose and aim from the Quality Account is not evident. Even with the removal, this research has shown there is little differences in how Infographics, Tables or Graphs were used over the four years. Quality Accounts are produced based on content targeted for a specific community and may help explain why there were no real differences.

The main limitation of this study is that it looked at six HHS in a specific regional area of Victoria over four years, so caution should be taken when making generalisations about larger populations based on these results [24,25]. However, opportunities exist to expand this study into other HHS across regional and rural areas and over a longer period. Of interest here is the announcement that due to the COVID-19 pandemic, public health services were not required to submit a Quality Account for 2020-21 [33].

Future academic research could also be undertaken from other perspectives. Firstly, the effectiveness of the Quality Account in engaging the community and meeting stakeholders' information needs could be independently confirmed. Currently, the HHS is self-regulating how effective they are at engaging the community and gaining feedback about how they are at meeting community needs. Independent research could undertake interviews or surveys with community members to understand how effective the Quality Account meets their information requirements about performance care. It would also be interesting to determine how much information users can understand in the Quality Account report and what benefits the report gives them.

There is also an opportunity to expand this study by determining what type of data is included in each communication tool. For example, what actual performance data is usually conveyed by tables, and what is data is more suited to graphs? This research was primarily a content analysis and did not go into the details of the

information portrayed. However, some research has indicated that emergency care may be best displayed through graphs [7].

A further question to be considered is whether Infographics, Tables and Graphs are being used as impression management tools instead of assisting understandability and supporting accountability and transparency. Previous literature in this area confirms that communication tools can be used for impression management where visuals can be systematically manipulated to project a favourable image [34]. Zhang [35] also suggests that positive or neutral financial performance is presented using vivid graphs, so nonprofessional investors perceive the results as better than they are.

Finally, the scope of this study was restricted to the Quality Account and did not consider the financial statements and supporting financial notes. Infographics, Tables and Graphs may be included in these reports, and a similar study could be targeted to the Annual Reports of HHS to see how these communication tools are used.

Observations of academic literature suggest the Victorian HHS publicly available reports are an under-researched area, and there exist opportunities to undertake additional research on these entities. This particularly study is useful to HHS, particularly as they continually try to meet their accountability and the understandability of their operational performance.

CONFLICT OF INTEREST
The authors declare that there is no conflict of interest.

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