Smartphone, Smart Surgeon, what about a 'Smart Logbook'?

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Background: Mobile phone applications (Apps) have become a vital assistant to medical personnel in today's technologically advanced era. The utility of Apps with case logbook capabilities has not yet been explored.
Objectives: To assess and evaluate all currently available surgical and procedural case logbook Apps.
Methods: A comprehensive search was conducted in April 2015 on the Android Play Store, iTunes (Apple App Store, iOS), and BlackBerry World for surgical and/or procedural logbooks. The search terms 'surgical logbook', 'logbook', 'procedure logbook' and 'surgical log' were used. Apps which could not be utilized as a surgical/procedural logbook were excluded. Each App was individually assessed and rated using preset criteria, by the unit consultant, registrars, and medical officer.
Results: In total, 2 740 Apps were assessed. After applying our exclusion criteria, only 16 Apps were relevant, and 11 suitable for critical review. Data sizes ranged from 510Kb to 12.2Mb. Costing of the Apps ranged from ZAR 0.00 to ZAR 105.32. The overall study scores revealed the following top five rated Apps: *Surgical Logbook by Surgilog; Surgeon Logbook Pro; Surgery Notebook, Surgical Logbook,* and *Universal Logbook*.
Conclusion: The current mobile Apps available are efficient in replacing traditional case logbooks. The use of the 'Smart Logbook' may become common practice in the life of the modern-day surgeon.

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The recent expansion in technological advancements has had an impact on all spheres of modern day society. The same has been observed with the impact of the Smartphone.[1] By definition, a Smartphone is a computer system within a mobile device that is able to perform various tasks, which include the running of third-party software and the possibility to download mobile applications (Apps).[2,3] Apps have a wide range of functions in medical education, drug calculation and interactions and can be downloaded free or at a cost.[4] These Apps run easily utilising the inbuilt Smartphone hardware.[5]

Previous surveys revealed that over 80% of residents use a smartphone and approximately 38% of physicians have admitted to using medically-related Apps on a daily basis.[1,6,7]

The presentation of a systematic case record or surgical case logbook has been a mandatory requirement to complete and stratify specialisation/registrar training in many countries, including South Africa. This logbook also has implications for consultants who need their case series logged for record keeping, follow-up and billing purposes. Since the modern-day registrar and consultant may not always have access to a desktop or pen and paper logbook, various mobile phone Apps ('Smart Logbooks') have been programmed to adequately serve this purpose.

We aimed, therefore, to assess, critically appraise and rank, all currently available surgical and procedural logbook mobile Apps ('Smart Logbooks') that are applicable to the surgical consultant or trainee, within the fields of general surgery and all the surgical sub-specialties.

Methods

A comprehensive search was conducted on the Android Play Store, iTunes, and BlackBerry World for surgical and/or procedural logbooks available in the public domain. The search terms 'surgical logbook', 'logbook', 'procedure logbook', and 'surgical log' were used within these search platforms using an iPhone, BlackBerry device and an Android (Google Play Store) compatible mobile phone. This comprehensive search was conducted on 02-04 April 2015. Apps which could not be utilised as a surgical/procedural

logbook were excluded from this study.

To avoid any antecedent account of bias, each App was individually evaluated and rated by the respective reviewer in isolation from other members of the unit. Rating was performed using tailor-made, standardised, preset criteria that included key features needed to serve the purpose of a 'Smart Logbook' (Table 1). This review was individually performed by the unit consultant, two registrars, and the attending medical officer. The preset criteria utilised were specifically selected and structured to assess various important components of the individual App, including: appeal of design, space for patient demographics, App security, ability to monitor trends, number of operative photos attached, description of surgeon's role, accommodation to sub-specialties, record of patient's billing and payment, ability to export records to the iCloud (if applicable), personal computer or printing capabilities and an overall impression (subjective) score.

Scores within each of the above sub-categories were added up for each App per reviewer. The tally of all the reviewers' scores for each respective App was then added together and an average was taken as the overall assessment score for this study.

Results

In total, 2 740 Apps were assessed. After applying our exclusion criteria, 2 724 Apps were excluded. The remaining 16 relevant Apps matched the study criteria (Figure 1. Flow Diagram).

A further 5/16 could not be adequately assessed since 2 were non-English [*Op log, Op log lite*], 1 required a restricted access college membership [*ACS SSR*], 1 could not

Table 1. Custom-made scoring grid depicting the criteria assessed during the scoring and evaluation of all the 11 'Smart Logbooks' assessed.

	Key Question?	Category Assessed	Category Scoring Grid				
			1	2	3	4	5
1.	Design appeal?	Graphics and Display	Unsightly	Dull	Okay	Beautiful	Wow
2.	Does the application allow me to enter all the patient's demographic and diagnostic details?	Patient Details	Name only	-	Name and Birth details	-	All details
3.	Are passwords and codes in place to ensure patient confidentiality?	Confidentiality and Security Issues	No	-	Average	-	Yes, very secure
4.	Can I formulate a trend of cases, and compare different time frames?	Statistics	No	-	2 periods only	-	Excellent, also displays a trend
5.	Does the App allow me to import Pictures, Photographs, Results and specific Patient details?	Importing Capability	No	-	One picture/ Case	-	Many attachments allowed
6.	Can I record my exact role in the procedure, Was I an observer/1st, 2nd, 3rd Assistant / Main Surgeon ?	Specification of the Practitioner/ Surgeon's role	No	-	Assistant / Surgeon only	-	Yes, easily attachable
7.	Can this application be adapted to all surgical sub-specialties?	Universality	No	-	2 specialties only	-	Yes, all included
8.	Does this App, have the capability to record the patients payment and/ or billing history?	Financial Record	No	-	Payment record only	-	Updated Billing/ Payment status
9.	Can I email, transfer, message and print my logbook?	Forwarding Options	No	-	Possible, with Difficulty	-	Very Easily
10.	My general overall impression [Scored/5]	Overall impression	Never download this again	-	Okay	-	Highly Recommended

be utilised due to a technical error [*iDoctor*], 1 duplicated with no difference other than unlimited data storage [*Surgeon Logbook free*]. A breakdown of the 3 platforms utilised by the Apps that were suitable for the purpose of this study revealed 12 Apple, 7 Android, and 0 Blackberry. The overall rating and individual specifications of the individual Apps assessed within the study have been tabulated (Table 2).

Only 3 Apps were available on multiple platforms. Data sizes of the reviewed Apps, ranged from 510Kb to 12.2Mb. The pricing of the Apps/Surgical Logbooks ranged from cost-free to R105.32.

The frequency of updates within Apps assessed on the Apple platform has been listed (Table 2). The frequency and history of previous updates on the Android platform were not available in the public domain. This update frequency gives users an idea of the progress and potential for improvement within an App. We have observed that both *Mobile E logbook* and *Universal Logbook* had undergone at least 20 updates in the time frame assessed.

Our overall scores revealed the following top five rated Apps in order of performance: *Surgical Logbook by Surgilog; Surgeon Logbook Pro; Surgery Notebook, Surgical Logbook, Universal Logbook* (Figure 2).

A closer look at the TOP-5 performing 'Smart Logbook' Apps':

Surgical logbook scored an overall rating of 88% and was thus rated as the best performing 'Smart Logbook' App in this study. It was created by Surgilog, an IT and medical team specialising in medical case logging. The Apple Store user rating had rated it as 3/5 (at the time of writing). This App only takes up 2.3Mb (Android) or 5.5Mb (Apple) of space and is offered free with regular updates. The password protection within this App allows easy syncing to the iCloud or email. The user is also able to monitor stats and identify trends of cases inserted. Furthermore, this App creates a professional record for the surgeon including a much needed track record of academic activities, a feature very useful for the trainee or academic surgeon. The patient data insertion page, 'new procedure', is clear and easy to negotiate through (Figure 3). These above-listed features, along with the fact that it is currently freely available for download, made this the overall top-rated App within this study.

Surgeon Logbook Pro scored 84% in the overall rating, and was created by AppLand in India. No listed user ratings or reviews were listed in the Android Playstore at the time of writing. This App cost R105.32 and uses 1.75Mb of space. The application is password protected and allows for export of records. The App has a comprehensive patient record system

Table 2. Table documenting the overall rating and specifications of the individual Apps assessed (listed in order of performance)

App	Study Rating	Platform	Size	Cost (ZAR)*	Last Updated	Update Frequency
Surgical logbook by Surgilog	88%	Android	2.3Mb	Free	19/02/2015	Not available
		Apple	5.5Mb	Free	26/02/2015	9 since 14/11/2013
Surgeon Logbook Pro	84%	Android	1.75Mb	R105.32	28/05/2014	Not available
Surgery Notebook	81%	Apple	2.8Mb	R59.99	30/05/2012	1 since 20/5/2012
Surgical Logbook	76%	Apple	1.1Mb	R49.99	14/08/2012	9 since 16/03/2011
Universal Logbook	75%	Apple	12.2Mb	R59.99	16/11/2014	20 since 26/08/2010
Surgeons logbook	71%	Android	6.71Mb	Free	20/01/2014	Not available
Ortho logbook	70%	Android	6.17Mb	Free	16/12/2014	Not available
Mobile E logbook	64%	Android	510Kb	Free	31/01/2014	Not available
		Apple	1.7Mb	Free	07/11/2014	20 since 11/11/2011
SurgiChart	61%	Apple	6.5Mb	Free	08/02/2013	Not available
CT Case Log	58%	Apple	8.8Mb	Free	19/08/2011	0 since 8/2/2013
Surgeon Logbook	52%	Android	591Kb	R35.33	10/09/2014	Not available
		Apple	1.8Mb	R36.99	13/09/2012	Not available

* Rand (ZAR) :Dollar (USD) : conversion rate 13.08:1.00. Retrieved from www.xe.com on the 18/10/2015.
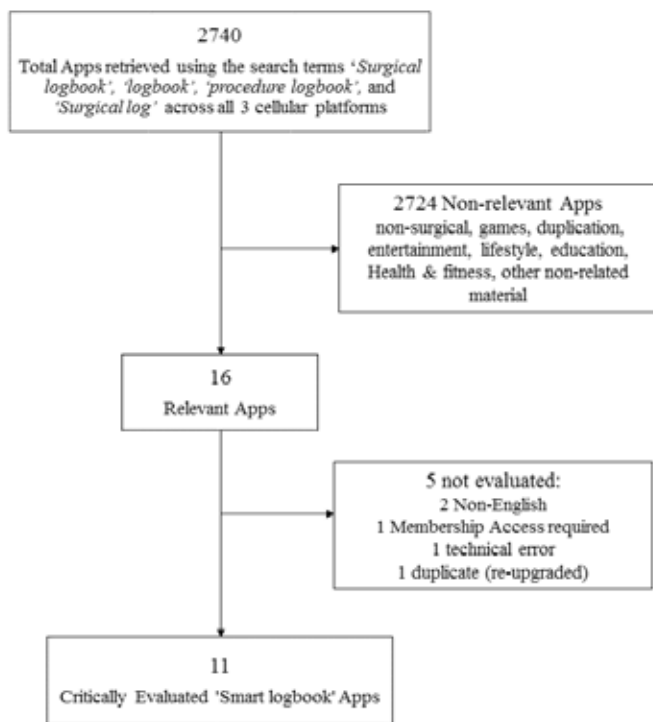
Figure 1. Flow diagram depicting the search outline of the 'Smart Logbook' Apps available across the Android Play Store, iTunes and BlackBerry World Platforms.

and an additional payment record function. The designer also promotes unlimited data storage which makes it different from its free version, *Surgeon Logbook Free*.

Surgery Notebook was created by Universal Computer Consultants Pty Ltd. The reviewers of this study rated it as 81%. At the time of writing, there were no official reviewer ratings listed in the iTunes Store. It is only used on Apple iPhones, cost R59.99 and uses 2.8Mb of space. *Surgery Notebook* is secure and allows for comprehensive record keeping with the capability to export. Reviewers of the current study found it to be user friendly but did also note some technical errors (the App freezes occasionally). A point

of note, the registered name *Surgery Notebook* and the screen cover image (*Surgery Notepad*) do not match.

Surgical logbook - Medicus is also restricted to the Apple platform. It is password protected, has limited space for patient demographics but has an easy export function. The demographic details on the insertion page, such as the surgeon's name, hospital details and common surgical procedure names or complications can be tailored to the user. After manually inserting these details, these options become saved within the App, allowing easy selection from the 'drop down' menu in the App once it has been inserted. This feature is very useful as it saves users significant time during the data capture process.

Universal Logbook was created by Raj Burgul. The App is not secure, since access is not password protected. This App does not allow for the insertion of detailed demographic data and there is no space allocation to record a surgical assistant's role. However, it does have an export option and a very useful search function. This logbook is adaptable and can also be used for the storage of other non-medical data.

Another important feature present in all the top five listed Apps is that they allow for the attachment of intraoperative photographs to the patient's record. This feature is very useful for future reference, case reports, research, presentations and patient follow-up.

Certain features available within all the Apps assessed are favourable and noteworthy and may be more important to some users. For example, a back-up with a 'Drop Box' feature (*CT Case Log*), individualised menu drop downs (*Surgical Logbook*), synchronization with a calendar (*Surgeon Logbook*), an option to add on colleagues (*SurgiChart*), and an option for both pre- and postoperative images to be incorporated under the same patient profile (*Ortho logbook*) are amongst other noteworthy features observed during this review.

Discussion

Various service providers offer similar smartphone devices; therefore, as a point of reference, smartphones are at times classified according to the mobile operating system that
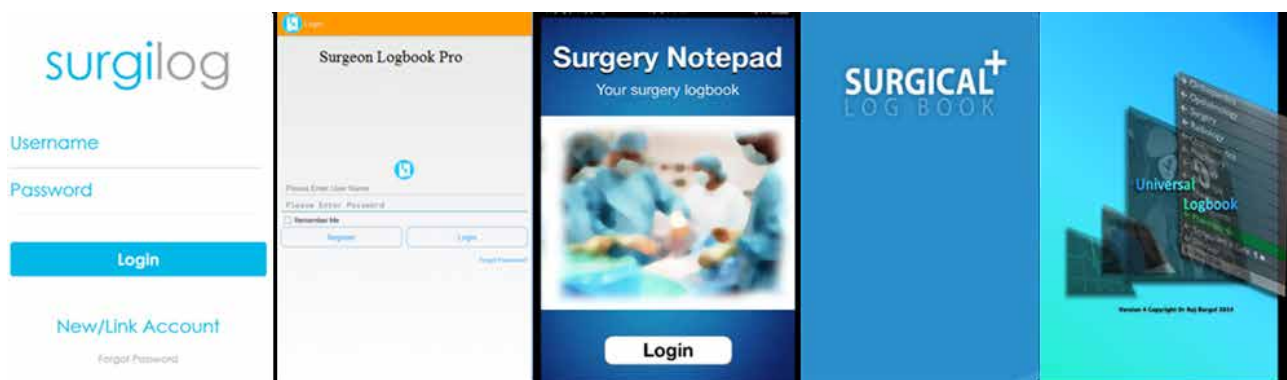

Figure 2. Cover page screenshots of the top five rated 'Smart logbook' Apps (listed from left-to-right; Surgical Logbook by Surgilog; Surgeon Logbook Pro; Surgery Notebook, Surgical Logbook-Medicus, and Universal Logbook). (Note:The cover image and registered App name do not always correspond.)

Table 3. Tabulation of the current surgical Logbook requirements for final examination admission, for the general surgical and sub-surgical disciplines. Data collated from the Colleges of Medicine of South Africa (CMSA) (Website accessed from https://www.cmsa.co.za/ on 20th May 2016).

| CMSA exam	Logbook format required	Procedures required listed	Minimum number of procedures specified	Role within procedure to be specified as	ICD 10 codes present
FCS (SA)	MS Word /Excel	Yes	Not Specified	US=UnScrubbed; S=Scrubbed; A=Assisted	Yes
FC Urol (SA)	MS Word /Excel	Yes	Yes	NS = performed unsupervised; S = supervised; SU= senior not scrubbed; A = assisting	Not Specified
FC Ortho (SA)	MS Word /Excel	Yes	Not Specified	A=assisted; SS=Supervised by Scrubbed Senior; SU=Supervised by unscrubbed senior; T= Taught a junior; NS= Not supervised	Not Specified
FC Plastic & Reconst (SA)	MS Word /Excel	Not Specified	Not Specified	No supervision [NS] or under supervision by a qualified surgeon [S] or if you acted as first assistant by a qualified surgeon [A] or as an observer [O].	Not Specified
FC ORL (SA)	MS Word /Excel	Not Specified	Not Specified	Surgeon /Assistant	Not Specified
FC Neurosurg (SA)	MS Word /Excel	Yes	Yes	PS – the registrar did the procedure independently or had specialist supervision but was the principal surgeon; or AS – the registrar either did part of the operation under supervision or was the first assistant during the procedure	Not Specified
FC PaedSurg (SA)	MS Word /Excel	Endoscopy Listed	Not Specified	NS = performed unsupervised; A = assisting	Not Specified
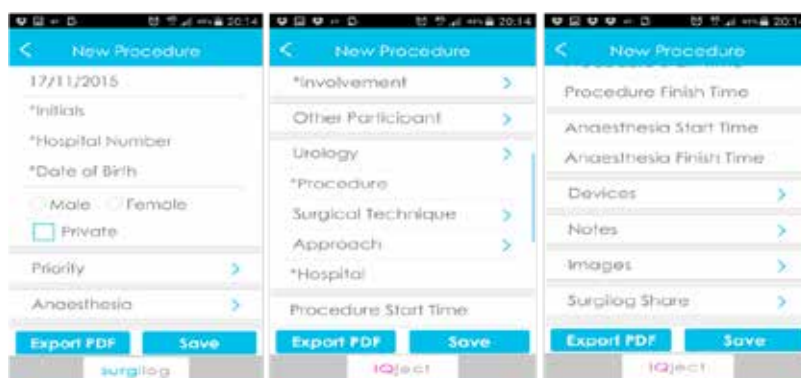
Figure 3. Surgical logbook patient data insertion page

they run.[8] The most commonly used smartphones worldwide are Apple's iPhone and Samsung's Galaxy, and the largest application stores include Apple's App Store (iOS), Google Play (Android) and BlackBerry World.[9] For the purpose of this study, we thus aimed to focus on the above three platforms.

The South African mobile phone retail sector noticed an increase in sales, since more affordable versions of smartphones have entered the market. With the ongoing decrease in data and internet costs, the competition between mobile phone operators will continue to intensify.[10] These factors have made the growth of the smartphone market sector in South Africa amongst the fastest in the world.[11]

The impact of mobile phone Apps on Clinical Medicine and its practice has been immediate and its extent far reaching, with beneficial Apps in many diverse fields, such as Dermatology, ENT, Adult Surgical Specialties and even in the modern domain of Paediatric Urology.[3,4,12,13]

The following 3 Apps were available on multiple platforms: *Surgical Logbook* by Surgilog, *Mobile E Logbook* and *CT Case Log*. This makes the use of these Apps a more versatile option, since users will not have concerns if they intend to upgrade or switch to another platform or mobile device at a later stage.

The cost factor was also a significant variable that needed consideration in this study. We observed that a higher purchase cost was not always associated with a better performing App. The top rated App, *Surgical Logbook* by Surgilog was available freely on both the Google Play Store (Android) and Apple App store (iOS) platforms.

App 'freezing' was a problem encountered with two Apps (*Surgery Notebook* and *Surgichart*). This was of concern since the demographics entered could not always be completed prior to the 'freeze', which sometimes resulted in the loss of valuable patient data.

An obvious limitation encountered within all peer-reviewed publications reviewing studies of this nature is the discrepancy between the App updates and the lag time from first submission to the article publication date. Thus, this study may not be up to date on the date of publication, since updated Apps may have been available after this manuscript was written and subsequently accepted for publication.

The other often overlooked aspect is the concern of patient privacy and confidentiality, a matter which practitioners need to proactively maintain in the current era of technology and easy accessibility to social media.[14] These factors need special consideration when entering patient details and operative photographs into the 'Smart logbook'.

A recent assessment of the current surgical Logbook requirements for the General Surgical and Surgical Sub-specialty final examinations from the local Colleges of Medicine of South Africa (CMSA) was reviewed; accessed from *https://www.cmsa.co.za/* on 20th May 2016.

The differences between the various surgical colleges have been tabulated (Table 3). Some specialties prefer different descriptions of the actual surgeon's role within the logbook and certain parameters were not always specified. Although the majority of the requirements assessed (Table 3) are present within the top five Apps reviewed, there is room for App developers, examination boards and the relevant academic surgeons to review these requirements and tailor-make Apps to fulfill each specialty's requirement. This would lead to a more thorough Logbook review process and avoid the 'precious' time interruptions from candidates, during the weeks preceding their final examinations.

Although the file transporting capabilities have not been explored across different file formats within this study, it would prove useful if Apps allowed importing and exporting of the comma-separated values (.csv) file formats as well. This facility would make tabulation data easier to interpret and evaluate while using the 'Smart Logbook'.

A logbook may also need verification against another format to ascertain that it has been captured correctly, and is indeed the correct reflection of a surgeon's actual experience. This is especially relevant when one's logbook is needed for verification processes with a professional body, or if medico-legal issues are queried. The current verification processes in South Africa may be done manually, but, as is the international trend, this may soon become matched to electronic records and data from the attending hospital or associated recording facility.

Furthermore, the concept of securing the accessibility and transfer of this confidential data also requires a security login verification to attain access to this information. Within this review, this factor was used as a scoring point

(Table 1): 'Are passwords and codes in place to ensure patient confidentiality?', as this feature holds importance within the framework of any secure 'Smart Logbook'.

Conclusion

After reviewing all currently available 'Smart Logbook' Apps that could substitute the traditional case logbook, we have observed a vast gradient in performance.

The obvious benefit of utilizing Apps available on multiple platforms is that the surgeon has the freedom to change platforms at a later stage, without missing out on the App they had just become so accustomed to using.

The current Logbook practices, requirements and submission methods used within a South African context could be improved to become a more regulated, secure, simplified and accessible method of data collection, by adequately utilizing a 'Smart Logbook'.

The top five performing Apps, in order of performance were independently ranked as: *Surgical Logbook by Surgilog, Surgeon Logbook Pro, Surgery Notebook, Surgical Logbook,* and *Universal Logbook.*

Surgeons in today's modern era need to embrace the technological advancements at their disposal. The 'Smart Logbook' will make case record-keeping more convenient than ever before, since the mobile phone is always 'close at hand' to the ever-busy surgical trainee or consultant.

Conflict of Interest

None

Acknowledgments

REFERENCES

1. Wallace S, Clark M, White J. "It's on my iPhone": attitudes to the use of mobile computing devices in medical education, a mixed-methods study. BMJ Open. 2012;2(4):e001099.
2. Franko OI. Smartphone apps for orthopaedic surgeons. Clin Orthop Relat Res. 469(7):2042-2048.
3. Brewer AC, Endly DC, Henley J, Amir M, Sampson BK, et al. Mobile Applications in Dermatology. JAMA Dermatol. 2013;149(11):1300-1304.
4. Wong M, Fung K. Mobile applications in Otolaryngology – Head and Neck Surgery. Otolaryngol Head Neck Surg. 2015;152(4):638-43.
5. Stevens DJ, McKenzie K, Cui HW, Noble JG, Turney BW. Smartphone apps for urolithiasis. Urolithiasis. 2015;43:13-19.
6. Franko OI, Tirrell TF. Smartphone app use among medical providers in ACGME training programs. J Med Syst. 2012;36(5):3135-3139.
7. CompTIA. Healthcare practices embrace mobile technologies, new CompTIA research reveals. http://www.comptia.org/news/pressreleases/11-11-16/Healthcare_Practices_Embrace_Mobile_Technologies_New_CompTIA_Research_Reveals.aspx[Accessed 12 June 2015].
8. Székely A, Talanow R, Bágyi P. Smartphones, tablets and mobile applications for radiology. Eur J Radiol. 2013;82:829-836.
9. ABI research's smartphone and handsets market research. http://bit.ly/1tvVs3i. Updated 7 July 2014[Accessed 12 June 2015].
10. Euromonitor International. Mobile phones in South Africa: Executive summary 2014. http://www.euromonitor.com/mobile-phones-in-south-africa/report [Accessed 20 November 2015].
11. E Marketer. Smartphone User Growth in South Africa Among Fastest Worldwide 2014. http://www.emarketer.com/Article/Smartphone-User-Growth-South-Africa-Among-Fastest-Worldwide/1011752 [Accessed 20 November 2015].
12. Kulendran M, Lim M, Laws G, Chow A, Nehme J, Darzi A, et al. Surgical Smartphone Applications Across Different Platforms: Their Evolution, Uses, and Users. Surgical Innovation. 2014;21(4):427-440.
13. Myint M, Adam A, Herath S, Smith G. Mobile phone applications in management of Enuresis: the good, the bad and the unreliable! J Pediatr Urol. 2016 April;12(2):112.e1-6. doi: 10.1016/j.jpurol.2015.09.011. Epub 2 Nov 2015.
14. Grobler C, Dhai A. Social media in the healthcare context: Ethical challenges and recommendations. S Afr J BL. 2016;9(1):22-25.DOI:7196/SAJBL.464