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Original Research Article

ACDC: a simple app for abdominal wall closure data collection

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ABSTRACT

Background: With the aims of getting evidence-based guidelines and decision making, well supported by strong, high quality data. We have developed an easy surgeon friendly mobile app which can be customized to the need by just decoding it.
Methods: We have use this app to analyze the outcomes of midline rectus sheath closure with different techniques and different sutures in terms of SSI, wound dehiscence, suture knot granuloma, burst abdomen and incisional hernia(IH). All the details regarding patient's demographic status, surgical technique, suture used and follow up were recorded in the form of EDC (Electronic Data Collection) with the mobile app.
Results: Total 595 cases with mean age 48 years underwent midline closure. The most preferred technique was continuous running technique with polypropylene suture (54.1%) followed by herringbone technique with polypropylene suture (27.7%), continuous running technique with polyglactin suture (18. 2%).The incidence of IH was 4.05% with continuous running technique with polypropylene suture. The data of desired variables can be accessed easily just by few clicks.
Conclusions: This mobile app is reliable, fast, cost effective, and generates a credible and valid data along with the basic statistical analysis.

Keywords: EDC mobile app, Mobile app for surgeons, Techniques of midline closure, Rectus sheath closure

INTRODUCTION

With the advent of technology in the field of medicine, there has been incessant advancement in the field ranging from the data collection to consultation over telemedicine and surgeries being done by robots. This has led to the ease of working, and at the same time has given the conclusive strong evidences. These evidences are the prime tools for making guidelines, treatment protocols and to assess the usefulness of a particular procedure. Most of the available apps are commercial one, costly, cannot be customized according to individual need, for that one has to be dependent on the service provider.[1] To avoid this and to have a valid and credible data with analysis which can show us the error free outcomes, easy to access, we have developed the mobile app with the aims and objectives to evaluate and analyze the EDC (Electronic Data Collection), making it as a base model which can be applied for other surgical techniques also. Also, to assess the feasibility, simplicity, cost efficiency of this app to get evidence based surgical procedure's guidelines.

METHODS

This prospective observational study was done from march 2016 to September 2017 in government teaching hospital of central India with an aim of assessing the feasibility of mobile app in determining the outcomes of various methods of rectus sheath closure in terms of SSI,

wound dehiscence, proline knot granuloma, burst abdomen and development of incisional hernia. Since this is a basic template and its variables can be recoded or customized to suit any other study design in surgery or other speciality. The study was approved by the institutional ethics committee and informed consent was taken from all the patients. Next all the surgeons doing laparotomy, accessed this mobile app which was our main work force and the relevant demographic and operative technical data of participating patients were entered into the mobile app for further statistical analysis.

Inclusion criteria

All patients requiring midline laparotomy irrespective of gender.

Exclusion criteria

- Patients under the age of 14 years
- Patients with previous midline incision laparotomy
- Patients requiring incision other than midline.

The participating patients' demographic data like name, age, sex, treatment details and post-operative outcomes in terms of surgical site infection (SSI), wound dehiscence, burst abdomen, incisional hernia and suture knot granuloma were all recorded in the mobile app which we designed for this study. No paper proforma was used in this study and basic statistical data was generated by the mobile app itself and produced the results in consolidated and systematic tabulated manner.

Mobile app

This is the main work force of this study to make medical people more computer friendly. The need for the mobile app was drawn from the fact, that case load is huge and it generates tremendous amount of data, and it is difficult to search and find a particular record or any data regarding a particular variable at the fingertip. We coded this app in the Structured Query Language (SQL) because it allows accessing many records with one single command; and second, it eliminates the need to specify how to reach a record. And above all SQL became a standard of the American National Standards Institute (ANSI) in 1986, and of the International Organization for Standardization (ISO) in 1987 so it was most suitable programming language to begin with, at the first contact point.[2] It has various sections which are designed for data collection, analysis, review of the trend and assessing the data of a particular variable.

Patient record entry

In this part we enter the basic details of the patients which help us to have a quick communication profile for the follow up with the patient easily. It contains fields related to the identity, address and ward where patient was admitted with the hospital record number (Figure 1).

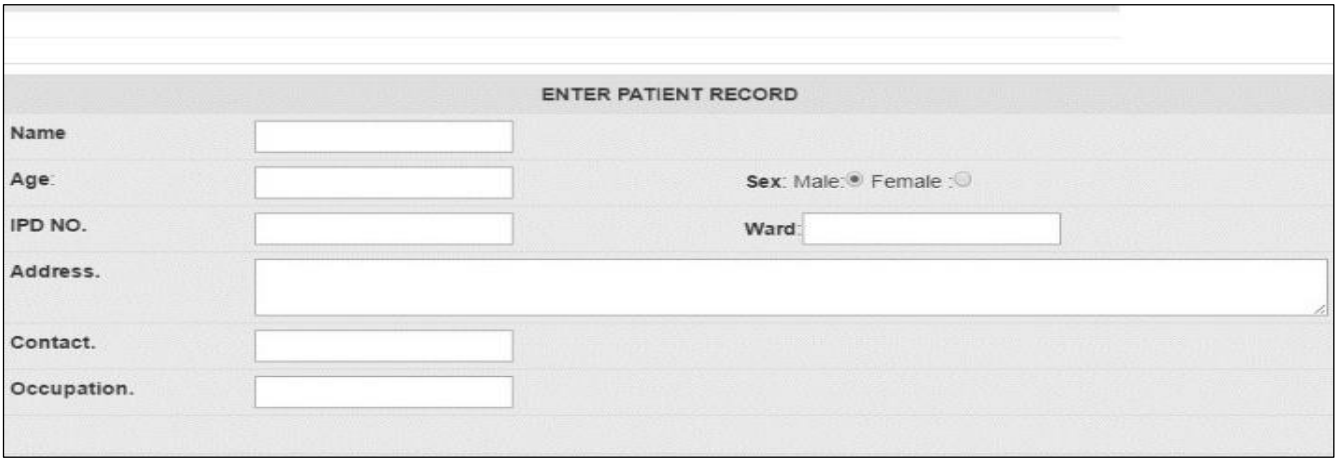


Figure 1: Demographic profile of the patients.

Surgical record entry

Details regarding the treatment planned/given (surgical technique, type of suture etc.) (Figure 2).

Post-operative outcome entry

This part allows us to accumulate the data related to outcomes of variables under study, along with the post op complications faced by the patient, with their follow up status. The cumbersome search for the paper record of a particular patient and penning down data, resolves to simple clicks on the app which is less time consuming and less prone to errors (Figure 3).

Search queries

This section deals with the data and outcome trends of a particular variable under study. The data of that particular variable can be easily retrieved along with simple statistical comparison generated in a tabulated manner (Figure 4).

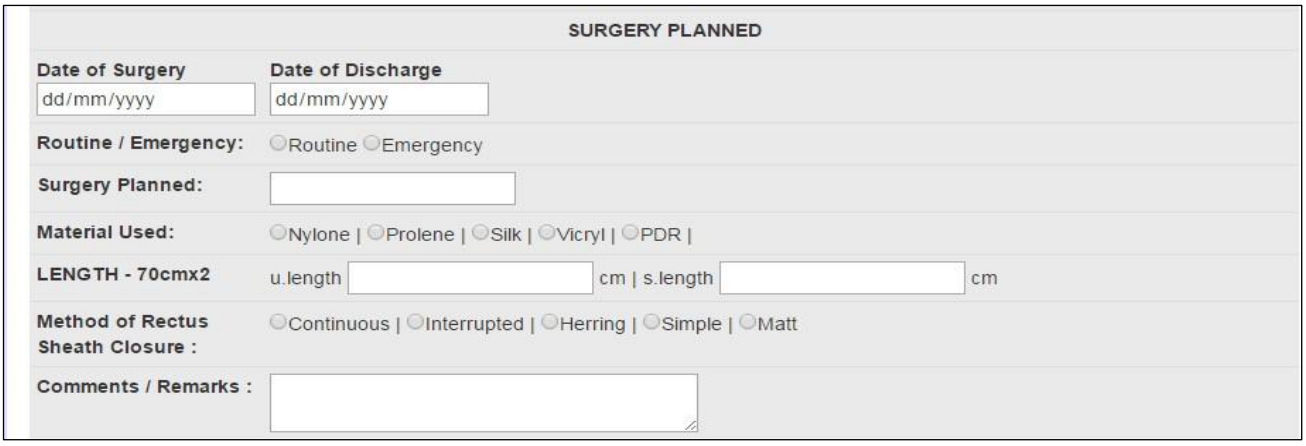


Figure 2: Addition of suturing technique so it is surgery planned and suturing technique.

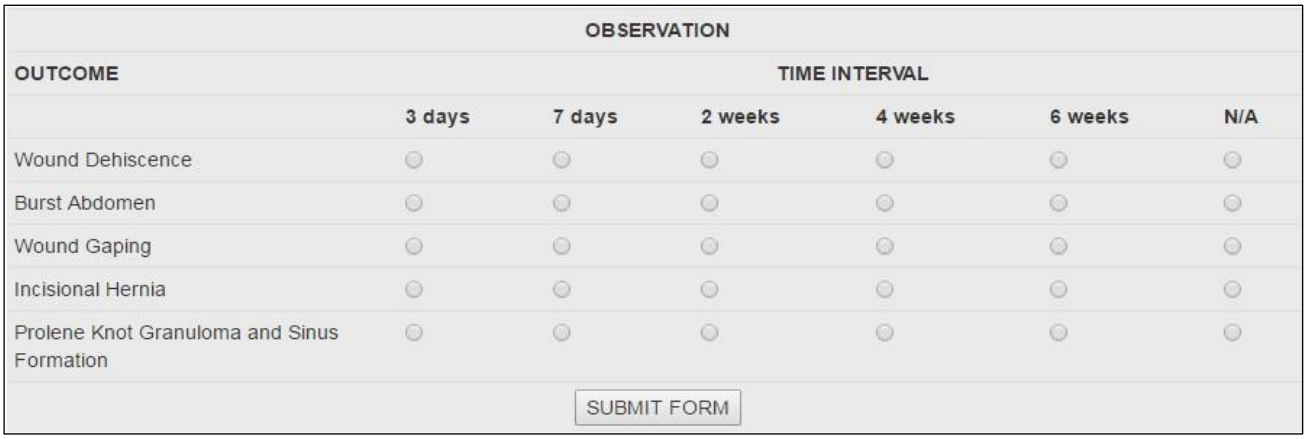


Figure 3: Screen capture of observation.

Figure 4: Screen capture of outcomes of different variable.

Data analysis and outcome assessment

There is no paperwork required for the basic statistical analysis and tabulation, all we need to do was to click over the option of viewing summary. All entered data records can be viewed and with array of options to look detailed record of any particular chosen variable in every possible manner. Data is dynamic in the mobile app so if any new record is entered then segregation of the data is done instantaneously, with addition of new data is done to the summary. So, the outcome changes the moment new data is added, so one gets the current trend of the particular variable. In the statistics section, we can retrieve the number of patients with a particular combination of variables of choice.

Review of any variable

This section deals with the statistical review of any chosen variable, where, one can opt for any variable from material, method or outcome, and can see its complete data ranging from demography to statistical outcome assessment (Figure 5).

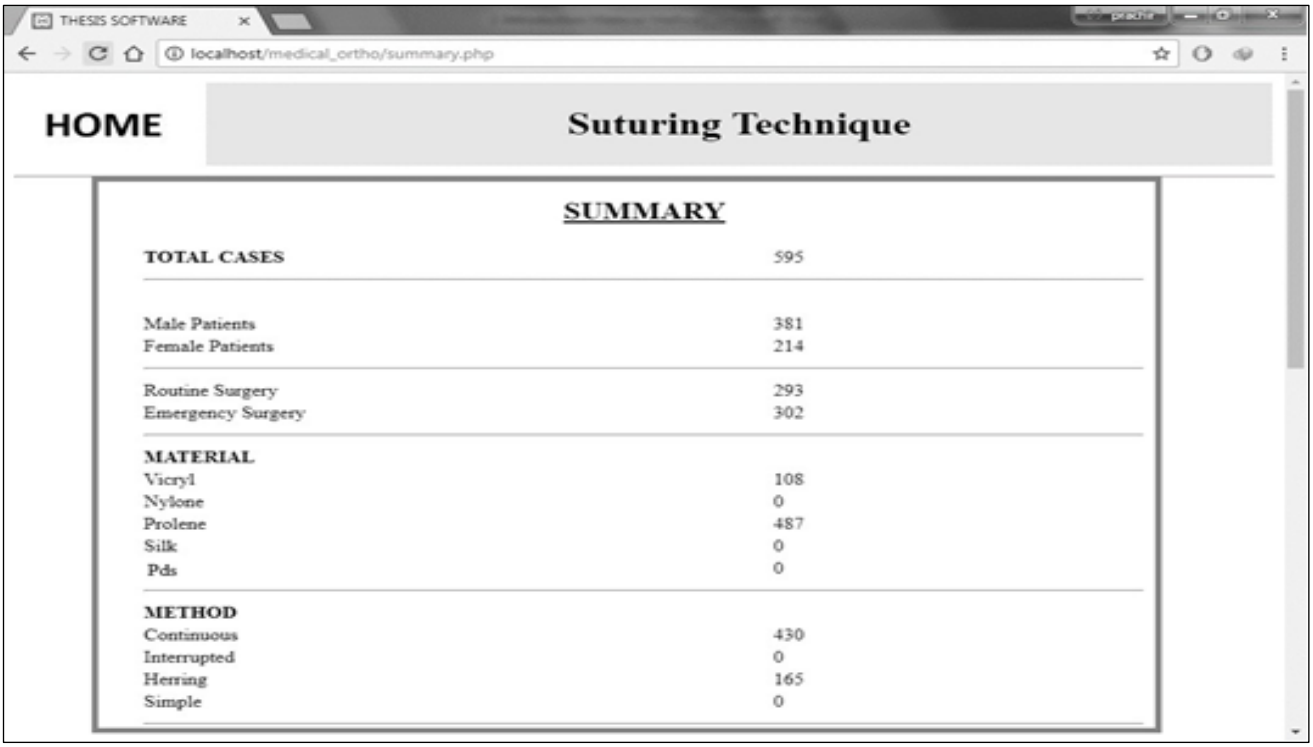


Figure 5: Demographic details.

Security

Since we can upload and create multiple data records so the question of security arises, this was addressed with adding up a security password for database. Moreover, the administrator of the data can only change the record otherwise its inaccessible for anyone. Thus, one can only see the observations and retrieve the data but cannot manipulate the records entered in the parent database.

RESULTS

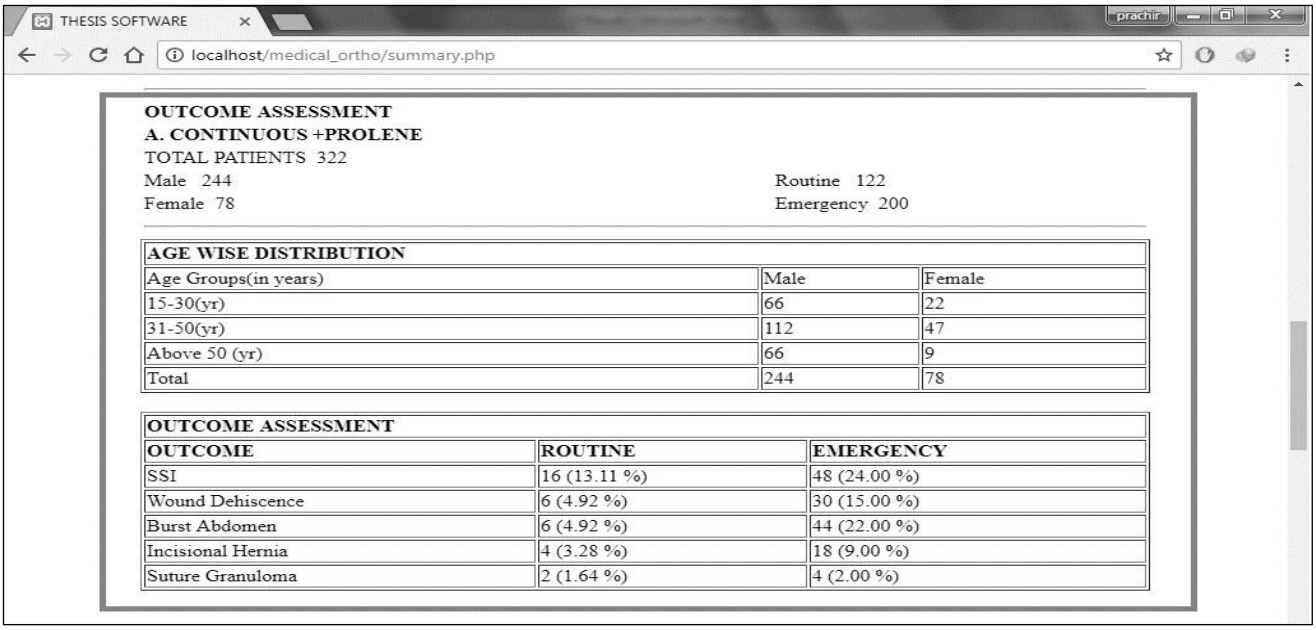
We assessed the outcomes of rectus sheath closure with combinations of different suture techniques and different suture materials. Total 595 cases were recorded. The mean age was 48 years (18-71 years). The demographic details are shown in Figure 5. Rectus sheath closure with continuous running suture with polypropylene no. 1 was the preferred technique 322 (54.1%%) followed by herringbone technique with polypropylene no. 1,165 (27.7%) and continuous running suture with polyglactin no.1 108(18.2%).[3] No interrupted suture technique was used. The outcomes of continuous running suture with polypropylene no. 1 Vs continuous running suture with polyglactin no.1 were in terms of SSI 19.8% and 10.1%, wound dehiscence 6.09% and 0.03%, burst abdomen 0.15% and 0%, incisional hernia 4.05% and 0.02% respectively. Continuous running suture with polyglactin no.1 was done only in routine cases. Outcomes were shown in Figure 6. Complete review or result of individual variable of choice suture material or technique or particular outcome can be seen by just a single click. (Figure 6, 7).

DISCUSSION

There has been a drastic change in surgical field, with the introduction of various technological tools that aims at making health care more effective, secure and helps in collecting, accessing and analyzing required information on a real-time basis. The development of data bases with systematically organized information, permits the use of computerization in scientific work and thereby results in more reliable conclusions.[1] Therefore, the improvement of data collection via computerization is indisputably important. This has led to improvement in patient security, quality of care, and accessibility to health care records and analysis.[4] For this access to up-to- date information may be required anywhere and at any time, and Information Communication Technology is supposed to facilitate decision-making by supporting health care personnel and students.[5,6]

The uniqueness of our mobile app lies in the design itself. Being coded in a way that it can be used as template for any other study. One just requires to change the variables and proforma according to the requirement of the study taking into consideration individual, institutional, regional variables affecting the results. Thus, it can be used again and again in any study design with minor modifications. In contrast to commercially available apps which do not permit the modification of code.[7]

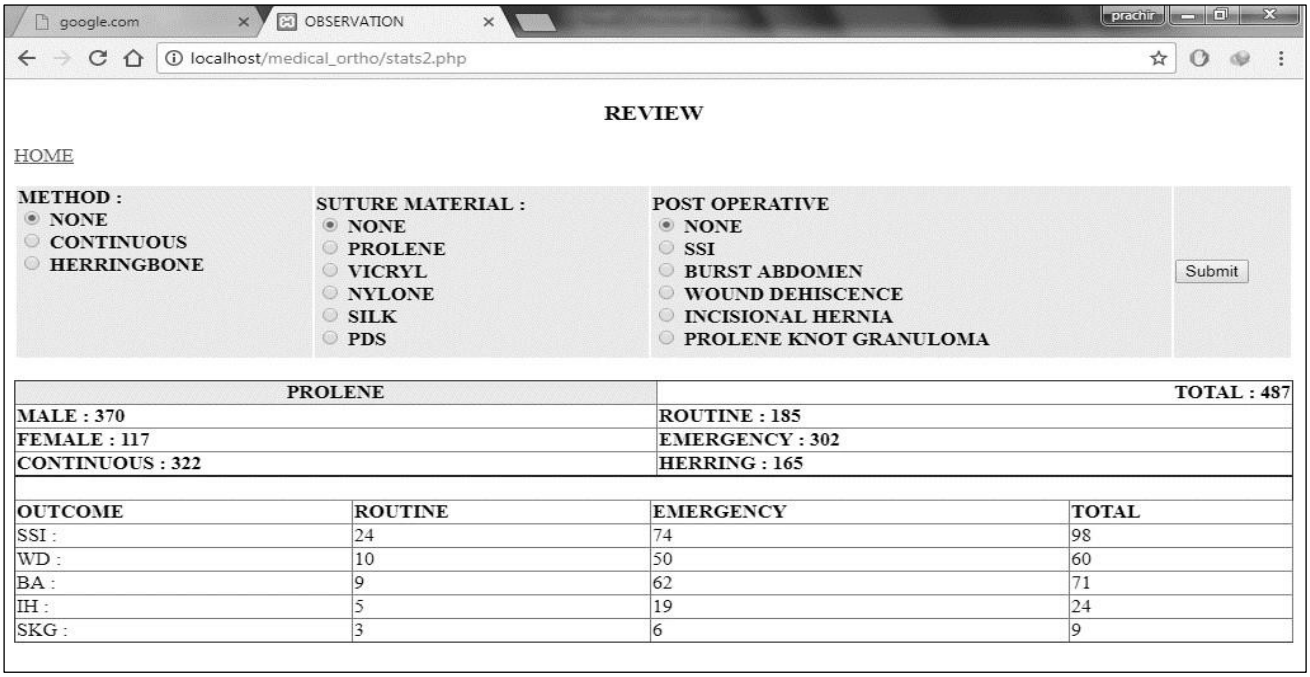
Although there are a few apps in surgery like CeDAR, EuraHS which does a similar task of measuring comorbidity and assessing patients risk in surgery.[8,9] But they are centered more towards the record capture and subsequent conversion to excel files that are to be assessed manually, which is different from our mobile app where everything is done by the app itself and there is no need of doing any manual paper work.



AGE WISE DISTRIBUTION		
Age Groups(in years)	Male	Female
15-30(yr)	66	22
31-50(yr)	112	47
Above 50 (yr)	66	9
Total	244	78

OUTCOME ASSESSMENT		
OUTCOME	ROUTINE	EMERGENCY
SSI	16 (13.11 %)	48 (24.00 %)
Wound Dehiscence	6 (4.92 %)	30 (15.00 %)
Burst Abdomen	6 (4.92 %)	44 (22.00 %)
Incisional Hernia	4 (3.28 %)	18 (9.00 %)
Suture Granuloma	2 (1.64 %)	4 (2.00 %)

Figure 6: Outcomes of different techniques of suturing and suture material (continuous running polypropylene suture).



PROLENE	TOTAL : 487
MALE : 370	ROUTINE : 185
FEMALE : 117	EMERGENCY : 302
CONTINUOUS : 322	HERRING : 165

OUTCOME	ROUTINE	EMERGENCY	TOTAL
SSI :	24	74	98
WD :	10	50	60
BA :	9	62	71
IH :	5	19	24
SKG :	3	6	9

Figure 7: Review and outcomes of different techniques of suturing and suture material.

The development of app should be such that it must allow us to collect, process and give dynamic results over a single interface, in order to minimize the errors. Clinicians in many parts of the world have undertaken systematic initiatives for high quality clinical databases after realizing the potential of electronic data capture and analysis systems.[10] Although paper-based case report forms are commonly used for studies but electronic methods of data collection and processing are becoming more popular and are considered an efficient way of computerizing the basic information depending on the chosen variables of the study designed. The direct data

entry at initial point facilitates easy tracking of the patients resulting in higher data quality and providing a clean and complete credible database within a shorter period of time.[11,12]

Data quality is measured by the errors in data entry. On the mobile app the record is saved only when all the fields are filled with values within the range, so the completeness of record was never an issue and it is reflected by other meta-analysis which supports that the improved data quality is a bit attributed to carefully structured questions.[13,14] Also electronic data is more complete and accurate and the mistakes in the laboratory values for variables has reduced in a study from 7% on paper based data collection to nearly zero in electronic data collection.[11,15]

Next consideration was time duration to complete one record. Since we were directly recording the data on mobile app and it was analyzed at the same time, so the overall time for data capture to analysis was significantly less for electronic method and similar results were seen in study where in paper based proforma took more time (3.o mins more) than EDC based record entry.[16] This suggested that data collection and analysis on mobile app is faster and easier than paper based proforma.

Efficacy of the data and its subsequent result has been the concern for all as it is the stepping stone that sets the course of the data collection and analysis over mobile app. Banik had been the first to publish metrics evaluating EDC versus paper data collection (PDC) and showed improvement in EDC efficiency over paper from 30% to 86% in terms time to quality of data.[17]

Feasibility and manpower saving is one of the important concern because if it's not feasible and consuming more time as compared to PDC then whole exercise is loss of productive time. From our experience its very much feasible and better to use over paper-based data collection and it is supported by literature where in Tiplady et al, reported for instance that the electronic data collection method reduced the time used for data handling by 80% compared to the paper-based method.[18] Similarly, Nyholm et al, reported that the time used for data handling was 96 hours with the paper-based method compared to 4 hours for the electronic method, showing a great usability in variety of studies with accuracy and great saving on manpower right from data entry to analysis and result production.[19]

There are a few drawbacks which needs to be addressed. Major one being the proper storage of data with security from intrusion and malingering of data and assurance of no data being lost from the time of entry to storage into the database, because if this is not met then whole exercise is in vain. At this point we feel that there is a need to get the statistical test like calculating p-value and getting level of significance of the data done by the mobile app itself that way it can do more justice with the data it handles. But being first of its kind, as we are limited by data, putting this mobile app on internet for global use and collection of data, the information then can provide the actual look into the prospective of each closure technique. By this we can determine the evidence based ideal technique for rectus sheath closure, till then these are just the loco-regional comparisons.

CONCLUSION

Mobile app is suitable and efficient in collecting data at the first contact point. It is reliable, fast, cost effective and generates a credible and valid data along with the basic statistical analysis. The organization and retrieval of data is very easy. Data regarding any desired variable can be accessed easily with a few clicks. Being versatile app it's variables and proforma can be changed as per the requirement of the different study designs. It delivers a valid data which can be utilized in number of ways from making institutional guidelines to finding out the common errors in any procedure. And being in the era of evidence-based medicine where the need for more valid data with optimum analysis in short time is the prime requirement to prepare guidelines, this app can be a milestone for this field.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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