Development of an integrated biobank data management software system for use by biobank staff, as well as for researchers to access required samples.

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Introduction

The CReATe Biobank, the first and the only certified Canadian reproductive biological materials biobank, banks a variety of sample types associated with de-identified clinical and demographic data from patients undergoing fertility treatments. All of the collected samples are the waste material of In Vitro Fertilization (IVF) and are biobanked in 3 categories including ovarian, embryology and andrology. Table 1 shows the variety of biospecimens collected in each category.

Biobank Categories	Examples
Ovarian	IVF retrieval waste materials, and endometrial fluid and cells
Embryology	arrested and normal donated embryos, embryonic genomic DNA, blastocoel fluid, embryo culture conditioned media,
Andrology	seminal fluid, spermatozoa, testicular tissues

Table 1- Sample types collected by CReATe Biobank

Some examples of ongoing research projects are[1]:

1. Determining the utility of candidate proteins in cells, follicular fluid, and embryo culture medium for the prediction of embryo quality, implantation and successful pregnancy during IVF
2. Determining biological factors that promote egg development
3. Development of new techniques for sperm and eggs freezing
4. Development of new techniques to select sperm for IVF procedures

Methods

The biobank was originally established in 2015 to meet internal research demands, and has grown to support an increasing number of national and international collaborations. Similar to most young biobanks we started with spreadsheets to manage the collections and later on moved to a Microsoft access-based database in which we faced multiple challenges including, unauthorized access and therefore inconsistency in records, errors in reporting, difficulties in organizing and integrating heterogeneous samples and clinical data, increased time of man hour for processing the sample requests, etc.

To overcome these challenges, address changing needs and to provide multi-disciplinary data integration, we developed a user-friendly database that enables us to efficiently load, query and document data. The CReATe BioBank Database (CBDB) is a browser-based application with a robust SQL back-end. This database allows for multi-device usability with the security, expandability and stability that Microsoft SQL offers. The premise of the design was to improve the accuracy and efficiency, without adding additional processes at the user level. This on-premise solution was designed to be run on a closed network with the following data security measurements: 1. Data encryption strategies 2. Data back-up at geographically disparate locations 3. Complete audit trail, along with a date and time stamp 4. Necessary server and auditing guidelines to ensure complete data security and privacy.

Results

The CBDB currently manages more than 10,000 samples and contains information about biospecimens, patients, data and everything related to repository management (users, and access restrictions) in which all personal identifiers are encoded in a de-identified fashion (Figure 1, advantages). The web portal has two graphical interfaces for two groups of authorized users, the biobank staff (Figure 2a, 2b) and researchers (Figure 3), to manage and access data, respectively. The researcher portal is designed for internal researchers only, to view de-identified samples and data and make their requests. Furthermore, an in-house, skilled IT team is available for system administration, maintenance, implementation, upgrades, data backup, disaster recovery, etc.

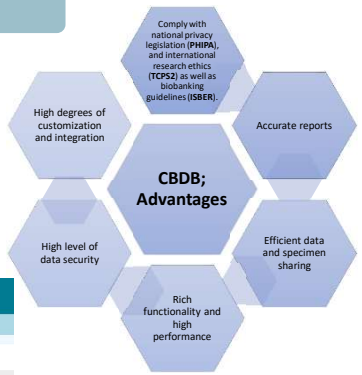
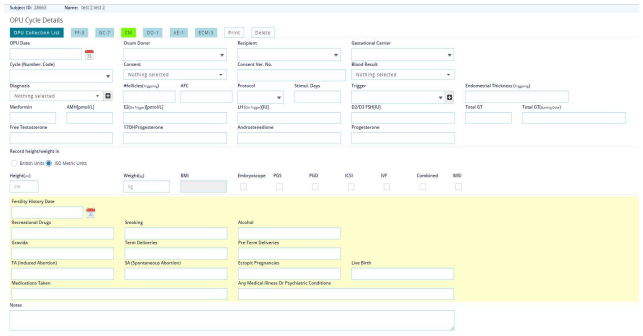
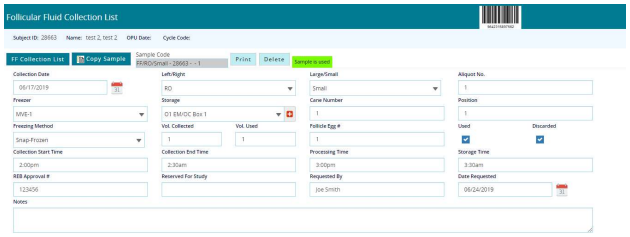


Figure 1- CReATe Biobank Database; Advantages

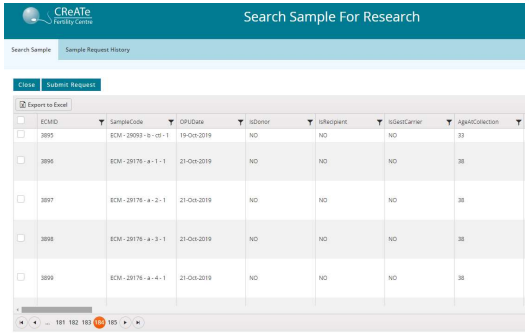


a) Clinical Data Collection



b) Sample information

Figure 2- CBDB main portal; Biobank staff access only



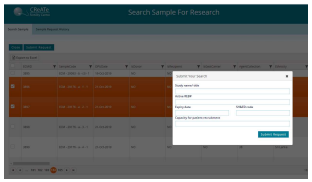


Figure 3- CReATe Biobank Biospecimen Request Portal

Conclusion

Numerous software solutions are developed for integrated biobanking management. However none of them supply a flexible model for fertility biobank customization. Therefore, we developed an integrated informatics platform where data are fully traceable and can be securely and efficiently stored, retrieved, and analyzed without dealing with the technicalities of the data grid.

References

1. RES-FRM-001-013 CONSENT FOR DISCARDED BIOLOGICAL MATERIAL FOR RESEARCH PURPOSES
2. ISBER (International Society for Biological and Environmental Repositories). 2018 Best Practices for repositories.

ACKNOWLEDGEMENTS

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