Children Are Not Small Adults: Insights into Pediatric Biobanks

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Introduction:

Over the last decade, the recognition of the practice of biobanking has dramatically increased and the collection of adult specimens and data has become routine. However, biobanking of pediatric samples has unique challenges and the International Society of Biological and Environmental Repositories (ISBER) approved the Pediatric Special Interest Group (SIG) in September 2017. Currently, this interest group consists of six pediatric or pediatric oriented biobanks in four different countries.

Figure 1:

Challenges in pediatric biobanking as identified by the Pediatric SIG. Although some issues may overlap with adult biobanking, the approaches required to solving these issues are specific to the vulnerable pediatric population.

Integration of Biobanking within Clinical Care

ISSUE:

- Vulnerable population; regulatory & societal issues

SOLUTION:

- Good governance of available samples
- Distinct assent categories to simplify, educate, and involve patients in the biobanking process as early as possible

ISSUE:

- Lack of investment by stakeholders; sustainability challenges

SOLUTION:

- Promotion/education by advocacy groups

ISSUE:

- Unique/small sample sizes, lack of controls

SOLUTION:

- Widespread frequent collections to enable statistically significant results
- Careful processing/new method development

ISSUE:

- Low incidence for childhood rare diseases

SOLUTION:

- Virtual networks & collaborations between pediatric biobanks; sharing of specimens/data

Table 1: Key Performance Indicators (KPIs) of the Pediatric SIG

Key performance indicators (KPIs), similarities and differences between Pediatric SIG biobanks.

Key Performance Indicators (KPIs)	¹ BC Children's Hospital BioBank, Vancouver	² The Tumour Bank, Westmead	³ John Hopkins All Children's, St Petersburg	⁴ Phoenix Children's Hospital, Phoenix	⁵ Children's Surgery Biobank, Houston	⁶ Cancer Society Tissue Bank, Christchurch
Start year biobank	2015	1998	2013	2009	2009	1996 (Adult – main focus) 2003 Pediatric
Type of biobank	Institutional	Pediatric Oncology	Institutional	Institutional under pathology department and IRB guidance	Congenital Heart Disease and other pediatric non tumor congenital malformations	Institutional Oncology that also includes Pediatric Oncology
Target audience	Maternal and pediatric	18 years	Pediatric	Up to 18 years of age	Pediatric	Pediatric
Consent type	Broad	Broad	Tiered	Broad	Broad	Broad
Delayed consent	Yes Acute situations only	Yes	Yes, rarely depending on the study	One month allowance (Only for "true" residual specimens)	Yes only for Transplants	Yes, timing when family is ready
Consent	19 years	18 years	18 years	18 years	18 years	16 years
Assent	7-13 years (separate assent) 14-18 years	10+ but on case by case basis	Varies by study and child comprehension	8 years and over	8-10 obtained if possible >13 verbal assent obtained but not documented Not required by IRB	Broad consent includes assent space used when appropriate.
Re-consent (Age of Majority)	Yes	Yes – case by case	Only if participating on a continuing study	For all patients enrolled who reach the age of 18 years	No, minimal risk & no grounds for re-consent (IRB); may be necessary later on	Yes – all at age 16+ years
# of participants recruited/year	~350	~150	~750-1000	~150	~500-600	~100 (2003 – 2009 used to be only solid tumours, 2017 all targeted)
Specimen types	Tissue, Blood, Body fluids, Stem cells	Tissue, Blood, BMA, CSF, other body fluids as needed. FFPE tissue	Tissue, Fluids	Tissue and biofluids	Tissue, blood, urine -surgical waste specimens	Tissues, FFPE – including BMA (trephines), Blood fractions
# of aliquots accrued/yr	~5,000 (~1,200/quarter, excl. PI-Driven)	~2,500	~10,000	~1,500	~5,000	~250
# of specimens requests/yr	~7	~8	~5	~1-2	~7-8	~1 pediatric Can also be included with adult cohorts
# of aliquots released/yr	~500	~200 but variable	~900	~100	~500	Variable
# of PI driven research projects supported	~25	~110	~19	~20	~7	~2
Multicenter study support	Yes	Yes	Yes	No	No	Yes – commenced end of Nov 2017
Distribution to industry	Yes	No	Yes	Available	Yes	Only in academic partnership
Return of secondary findings	Yes with REB approval	Yes but specified	No	Study dependent	No	Clinical significant findings? Yes
Marketing	Lobby slides, conferences, presentations, brochures, service posters, pediatric-friendly video	Bi-annual newsletter, service posters, direct liaison, conference presentations	Conferences, Presentations, Website	Brochure, website and face-face with investigators. Considering video.	Website, Conferences, Presentations	None, main use by Pediatric oncologists
Funding	Foundation, Fee for Service, Grants	Partial institutional funding, Charities, Donors/Benefactors, Grants	Fee for service Institution Internal foundation	State gift and fee for services	Partial institutional funding Commercial collaborations	Partial Grant funded, partial cost recovery; Adult studies subsidize ped collections
Cost recovery fee	Yes Target 60-80% 25% of total cost	No	Yes Target 60-80% Currently 30%-50%	Yes Fees currently covering 10% of costs	Yes <10% of cost recovery	Yes Tiered
Website	www.bcbhbiobank.ca	http://www.schn.health.nsw.gov.au/health-professionals/statewide-laboratory-services/tumour-bank	https://www.hopkinsallchildrens.org/services/biorepository	http://www.phoenixchildrens.org/medical-specialties/pathology/diagnostic-services/biorepository	https://www.texaschildrens.org/departments/heart-center-tissue-bank	https://www.otago.ac.nz/mackenzie-cancer/tissue-bank/index.html [TBA, 2018]
Newsletters to participants	Yes	Yes	No	No	No	No
# of publications with Biobank specimens/data	2	>50	1	3	~5	5 (pediatric)
# of conference presentations/posters	14	~30	4	3	~5	~20
Database used	ATIM (+) highly customized (-) challenging to maintain & update with so much customization → OpenSpecimen (+) many features (+) convenience (-) currently in development, challenging migration	Lab Matrix (-) currently managed at another site (-) difficult data linkage/communication between institutes	STARLIMS (Abbott) (+) high level of automation compatibility (-) high expense	Freezer Works (+) high customization (-) poor communication with clinical & redcap	Homegrown database (+) family linking (-) poor communication with clinical & redcap	Filemaker Pro (+) high customization by end user (-) no communication with clinical systems (-) was intended for adult participants, no longer works for pediatrics → Seeking alternative
Pros (+) Cons (-)						

Table 2: Contributing Areas of Expertise within the Pediatric SIG

Contributing areas of expertise from each site within Pediatric SIG.

Pediatric Biobanking Site	Contributing Areas of Expertise	Active & Proposed Projects/Collaborations within Pediatric SIG ➤ ISBER, Dallas 2018 Presentations
¹ BC Children's Hospital BioBank, Vancouver	- Promotion of biobanking - Education of all stakeholders - Ethical issues of pediatric biobanking	- Improving stakeholder knowledge on biobanking across all sites, surveys & questionnaires - Improve pediatric assent and re-consent at age of majority “Extended School Survey” presentation: ➤ Tues, May 22 – Contributed Papers Session 2
² The Tumour Bank, Westmead	- Ethical, Legal, Social Issues in biobanking (ELSI) - Public engagement & biobanking education - Long-term sustainability >20 years biobanking experience	Biobanking surveys, exploring public perceptions & awareness of biobanking “Research Meets Community” presentation: ➤ Tues, May 22 – Contributed Papers Session 2
³ John Hopkins All Children's, St Petersburg	- Prospective cohort sample collections - Quality management - Ethical, Legal, Social Issues in biobanking (ELSI)	“Paucity of RIN Score” quality management presentation: ➤ Tues, May 22 – Contributed Paper Session “PAXGene QA” poster: ➤ Mon, May 21 – Poster Session 1
⁴ Phoenix Children's Hospital, Phoenix	“Dry technology”; collection, storage, utilization of pediatric blood spot cards - Hospital Integrated pediatric Biobanking	Collaborating with blood spot card QC data (BCCHB) “Blood spot card” poster presentation: ➤ Mon, May 21 – Poster Session 1 “The Re-consenting Hurdles of a Pediatric Biorepository” presentation: ➤ Tues, May 22 – Contributed Papers Session 2
⁵ Children's Surgery Biobank, Houston	- Collaborative experience with drug development - Multicenter collaborations & data sharing	“Genomic Data Sharing” poster: ➤ Mon, May 21 – Poster Session 1
⁶ Cancer Society Tissue Bank, Christchurch	- Ethical, Legal, Social Issues in biobanking (ELSI) - Public education - Cross-border sample and data sharing - Biobanking of indigenous Maori communities	- Culturally responsive biobanking involving indigenous/minority communities (BCCHB) - Effective re-consent of pediatric donors at age of majority “ELSI” presentations: ➤ Mon, May 21 – Opening Reception ➤ Tues, May 22 – Contributed Paper Session 2

Future Directions:

By late 2018, the Pediatric SIG plans to:

- Review ISBER new Best Practices in regard to Pediatric biobanking
- Expand focus groups/workshops and surveys to gather stakeholder opinions on pediatric biobanking across Pediatric SIG sites
- Publication of ISBER BIO Special Edition on Pediatric Biobanking

Conclusions:

Pediatric biobanks present with unique challenges. Allowing the formation of a pediatric biobanking SIG will help to:

- Increase awareness of pediatric biobanking
- Share knowledge and development of pediatric specific policies, procedures and education.
- Foster collaborations within the ISBER community to ultimately improve pediatric biobanking internationally.