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Biobanking in the Pediatric Critical Care Setting: Adolescent/Young Adult Perspectives

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for the PICU Biobank

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Abstract

Biorepository research in children raises numerous ethical questions, which are heightened in the pediatric intensive care unit (PICU) setting. We conducted a cross-sectional interview based study of twenty adolescent/young adult (A/YA) PICU patients and seventy-five parents of PICU patients to elucidate perspectives on biorepository research. A/YA had a positive attitude towards biobanking. In young adults, comprehension was higher for knowledge of a choice to withdraw and participate in the research and lower for purpose, procedures, risks and benefits of participation. All but one A/YA wanted to have a say in whether their samples would be used. Parent views on child assent were mixed; 55% of parents favored child involvement in decisions. Efforts should be made to improve comprehension by A/YA and involvement of A/YA in decisions.

Keywords

informed consent; assent; biorepository; biobank; research ethics

Introduction

Biorepositories could change pediatric critical care by evaluating the role of genetic variation in susceptibility to critical illness and response to therapy,(Samraj, Zingarelli, & Wong, 2013; Wong et al., 2012) and by identifying important research and therapeutic targets.(Marini, Vincent, & Annane, 2015; Ntai, Baronchelli, Pellegrino, De Blasio, & Biunno, 2014)-⁵ For example, evolving technologies have revealed candidate biomarker panels that can predict sepsis-related illness severity and mortality.(Samraj et al., 2013; Wong et al., 2012)

However, biorepository-based research in children raises numerous ethical and regulatory questions such as determining the appropriate role for children and parents in decisions about participation.(Gurwitz, Fortier, Lunshof, & Knoppers, 2009; Hens, Cassiman, Nys, & Dierickx, 2011; Hens et al., 2013) Issues such as assent, whether to reconsent patients at the age of majority, and return of incidental findings require special considerations in the pediatric population.(Brothers, 2011; Brothers & Clayton, 2012; Giesbertz, Bredenoord, & van Delden, 2015; Hens, Cassiman, et al., 2011) Federal criteria has not deemed all biorepository models human subjects research.(Brothers, 2011; OHRP, 1997, 2008; White et al., 2016) Although proposed changes to the federal regulations contemplated characterizing all research using biospecimens (whether identifiable or not) as human subjects research, the final rule was less comprehensive.(DHHS, 2009, 2011, 2017) While this new version of the Common Rule provides some guidance on use of identifiable biospecimens, there remains some uncertainty about what constitutes adequate consent.

Additional layers of ethical complexity exist for conducting biorepository-based research in the critical care setting.(Menon & Ward, 2014; Shelton et al., 2009; Truog, 2008) Critically ill children are often too sick to provide assent, and their parents may be unusually stressed, making truly informed consent difficult. Determining the appropriate timing of consent during critical illness is also challenging, and perspectives regarding delayed consent are not well elucidated. Seeking consent for non-therapeutic research, such as participation in a biorepository, in the critical care setting requires special consideration.(Menon & Ward, 2014; Truog, 2008) Although the literature demonstrates children's desire to be involved in decision making about participation in a biorepository,(Geller, Tambor, Bernhardt, Fraser, & Wissow, 2003; Kong, Tarling, Strahlendorf, Dittrick, & Vercauteren, 2016) the appropriate role for children in the critical care setting remains unclear. Further, the literature on perspectives of surrogate consent for donation of samples for research in deceased patients continues to evolve.(Wilson-Genderson et al., 2018) This issue may be more relevant when samples are donated during a period of critical illness and risk of mortality may be high.

Perspectives of recent PICU patients regarding participation in biorepository research in the critical care setting have not been reported. Empirical research about adolescent and young adult (A/YA) views on biorepository research will facilitate ethically appropriate consent in this population.(Brothers et al., 2014) We conducted a cross-sectional interview based study of parents and A/YA in a pediatric critical care setting to elucidate perspectives on biorepository research. Our study aimed to add insight into the role for A/YA in research decision making and to identify areas for additional study.

Method

This study was part of a larger investigation testing an opt-in consent process (i.e., participation was not the default, but required permission) for a PICU biorepository (The PICU Biobank). Parent and A/YA patient perspectives were assessed in semi-structured interviews. In addition to interview data, clinical data was collected from the electronic medical record, including age, length of PICU stay, reason for admission, primary diagnosis, history of previous PICU admission, and whether invasive interventions occurred. Parents and young adults provided consent for participation; adolescents gave assent after parent(s)

provided permission. All study activities were approved by the hospital's Institutional Review Board.

The PICU Biobank Consent Process

From November 2014 to March 2016, an opt-in consent form, available in English and Spanish, for participation in the PICU biorepository was provided for every admission to the PICU (Appendix 1). PICU staff requested that all parents/legal guardians of PICU patients < 18 years complete this consent form, with or without the patient's input. No written assent was obtained from patients <18 years. Patients ≥ 18 years were asked to complete the form with or without their family's input, if their clinical status permitted. This consent process was developed to address institutional interest in an automated process that would reach every patient at the time of PICU admission without requiring research team member availability 24 hours/day for in-person consent and enrollment. The process was designed as opt-in to ensure an authentic choice by participants, whereas other models, such as an opt-out checkbox on the general treatment consent form, do not guarantee that the information regarding the biobank is actually read and considered separate from consent to treatment.

Because we were testing this novel consent process, we obtained waivers from the Institutional Review Board (IRB) for documentation of full informed consent. In addition, because most patients are unable to provide assent at the time of PICU admission due to their clinical status, we were granted a waiver of assent by the IRB. We evaluated whether adolescents participated in the decision as part of our interview study. PICU staff who provided the consent form to parents were educated that parents may choose to discuss participation with their child, depending on their perception of the child's clinical status.

Since one goal of this study was to evaluate the consent process, we defined limitations a priori as to how specimens could be used. Requests for use of samples for research are carefully reviewed by two individuals that are part of the PICU biorepository team. One member provides review for ethical considerations related to the proposed use of samples and a second individual provides scientific review. Following this review, requests require approval by the institutional biorepository director, who ensures compliance with institutional governance policies for biorepository use. As this consent process is being evaluated, samples have not been released for any studies proposing whole genome sequencing, or which may lead to incidental findings that could have clinical significance. All studies using samples are disclosed on a publicly accessible website, about which parents received information at the time of consent. Ethical acceptability, feasibility, and understandability of the consent form and process based on parent and health care provider input were assessed and will be reported separately. This report focuses on perspectives of ill adolescents and young adults on biobanking, given the limited literature in this specific population.

Interview Recruitment and Enrollment

We interviewed a convenience sample of adolescents (12–17 years), young adults (≥ 18) and parents at the time of the A/YA's PICU discharge. Adolescents ≥ 12 years of age and young adults >18 years of age who were medically appropriate for discharge/transfer from the

PICU at the time of screening, with normal cognition, off sedation for at least 72 hours, and who spoke and read English or Spanish were eligible. We also interviewed parents/legal guardians of children of any age admitted to the PICU during the study period (November 2014 to March 2016) who spoke and read English or Spanish.

Interviews

Three trained interviewers (AS, EN, NS) not caring for PICU patients conducted in person interviews using a semi-structured interview guide (available upon request), developed by our study team from available literature. The interview guide covered predefined domains related to understanding, perspectives on participation in biorepository research and preferences regarding return of research results, re-consent and assent (See Table 2). Trained medical interpreters facilitated interviews of Spanish-speaking participants.

For young adults and parents, the interview also included completion of a modified version of the Semi-Structured Comprehension Interview (SSCI), a verbally administered eight-item scale that assesses different aspects of research consent comprehension including study purpose, procedures, risks, benefits, and choice to participate and withdraw. (Paquette, Najita, Morley, & Joffe, 2015) Two questions on the SSCI about benefit to others and alternatives were excluded to avoid prompting comments about altruism, and because the only alternative was not to participate. According to published guidelines, each SSCI item was scored on a scale of 0 to 2, where 0 reflects no understanding, 1 reflects incomplete understanding and 2 reflects complete understanding of the question. Scoring took place as part of data analysis.

Because most patients were too sick at the time of PICU admission to participate in the consent process for the PICU Biobank, young adults were given the opportunity to review the PICU Biobank consent form prior to completing the SSCI (Appendix 1). Parents completed the SSCI based on their recall of information from receiving the consent form at the time of their child's PICU admission and then re-reviewed the actual consent after completing the SSCI. Adolescents did not complete the SSCI because they were not given the full PICU Biobank consent. Based on the input of parent and child-life study team members during study development, rather than reviewing the full PICU biobank consent, adolescents reviewed an age-appropriate, image-based version of the PICU Biobank consent (Appendix 2) during their interview. This version did not specifically cover items included on the SSCI such as choice about participation or withdrawal as we had a waiver of assent and knew that many adolescents would not have been given a choice regarding participation at the time the biobank consent was completed. Therefore, we did not administer the SSCI to adolescents and assessed their understanding qualitatively during the interview.

Data Analysis

Interviews were audio-recorded and transcribed verbatim. Transcriptions were uploaded into Dedoose, a qualitative analysis software. For interviews conducted in Spanish, only translated English dialogue was transcribed and analyzed. Three investigators reviewed all A/YA interviews (EP, SD, AS). Content analysis was used to analyze interview data. Codes were grouped by themes within predefined domains including understanding, perspectives

on participation, sense of ownership of samples and views on assent.(Hsieh & Shannon, 2005) A code library was developed based on the first five interviews; the investigators defined each code and reached agreement about its application. As remaining interviews were analyzed, new codes were added after group discussion and agreement. Approximately 15% of the total codes were added in this manner. Early interviews were re-coded using the final code library to ensure consistent coding. Data was analyzed completely after 10 interviews, and then repeated after completing another 10 interviews until data saturation on the predefined domains of interest was obtained. A similar process was used to code parent interviews. Because the focus of this manuscript is on A/YA data, the only data reported from parent interviews reflects responses to the question, “Is asking a parent’s permission enough or should we also ask the child or adolescent what they want?” The remaining parent data will be reported separately.

Parent responses were coded as yes/no in response to the question above. We conducted both univariate and multivariate analyses to identify predictors for parents’ views of assent (positive versus negative; positive = children/adolescents should be asked) with demographic and patient variables including gender, patient age, parent age, parent education level, primary language, PICU length of stay, PICU intervention, previous PICU admission, and parent response on the Biobank consent.

Results

During the study period we reviewed 95 A/YA records for eligibility. 52 A/YA met eligibility criteria and 47 were invited to participate in an interview. Twenty A/YA (15 adolescents and 5 young adults) assented or consented and were interviewed (response rate of 42.5%) (See Figure 1). Over the same enrollment period, 192 parents were invited to participate in an interview; 75 agreed to be interviewed (response rate 39.1%). Demographic information for the sample is presented in Table 1. The median age of adolescent participants was 15 years (range = 12 to 17 years) and median age of young adult patients was 20 years (range = 19 to 20 years). Key themes within each pre-defined domain of interest and representative statements reflecting each domain are included in Table 2.

Understanding

We assessed understanding of biobanking in both adolescents and young adults. In adolescents, assessment of understanding focused on genetic material. Most adolescents could provide a simple definition of a gene. Responses such as “[genes are] something that you get from your parents” (Interview 105), and “you give [them] off to your offspring and it continues for generations” (Interview 107) demonstrated understanding that genes are inherited and contain information that could be meaningful for related individuals. Other adolescents commented that genes contain unique or identifiable information, “like a specific thing in your body that kind of identifies you and the different things about you” (Interview 56). None of the adolescents had questions after reviewing the age-appropriate, image-based version of the biorepository consent form (Appendix 2). Adolescents also verbalized some understanding of the purpose of biobanking. Specifically, adolescents expressed understanding that the biobank consisted of leftover genetic materials that would

be used for research and supported the use of the samples in this way: “If it is going to be thrown away, it’s better to use it for research” (Interview 95). Some also understood that samples would be used to benefit others rather than the participants themselves, “It’s their studies. [It’s] for them to learn new stuff and maybe find a cure for some disease” (Interview 123).

Understanding of young adult participants was also assessed using the semi-structured comprehension interview. Young adults had a median score of 7.8 (out of maximum possible 12) on the SSCI (see Table 3). Comprehension was higher for knowledge of a choice to withdraw (1.9) and participate (2) in the research and lower for the purpose (0.9), procedures (0.9), risks (1) and benefits (1.1) of participation. Nearly all young adult participants were able to state that they had a choice to participate or withdraw from the biobank. Others expressed some understanding of the procedures and purpose for the biobank, with responses reflecting knowledge that samples were leftover, could come from multiple sources, and be stored for future research uses, for example, “you are going to store my remaining blood,” (Interview 039) and “you will be able to use the rest of the samples leftover from blood, urine, and other stuff for research” (Interview 097). No participants brought up any risks associated with participation when specifically asked to comment on risks. However, two participants did raise concerns about privacy, “I want to know who all might be sharing information of my blood” (Interview 071). Participants generally reflected understanding that biobank research would be for the benefit of others, although some statements also reflected expectation of potential direct benefit: “Other children will be helped and maybe myself” (Interview 035).

Perspectives on Participation

A/YA had a positive attitude towards agreeing to participate in biobanking research, with all A/YA expressing an altruistic desire to help others in statements such as “I can help them find like a cure or something for other people” (Interview 117) and “It feels good [to participate] because I can help other people” (Interview 122). All except one A/YA also wanted to have a say in whether their samples would be used, with responses ranging from definitive, “Yes! Because it’s my body” (Interview 105) to conditional, “I think that at a certain age, the patient should be asked” (Interview 056). One adolescent replied that it was not necessary to involve them in the decision in response to a question about whether they would like to be involved. Adolescents also generally indicated that they wanted their parents to be involved in the decision: “Ask me along with my parents” (Interview 087). 3/15 (20%) adolescents reported being involved in the original decision to participate in the Biobank.

Parent Views on Assent

Parent views on child assent were mixed, with 55% (41/75) of parents in favor of involving children in the decision. Some stressed the importance of involving the child in the decision, making statements such as “I feel that the child should be included since it is their leftover tissues and fluids. They can actually make a decision as well, like the whole family can” (Interview 033–1/2) and “I would definitely talk to them because they are the patients” (Interview 048–1). Other statements, including, “I don’t think a child needs to be asked. If

the parent says it is okay, it is okay” (Interview 020–1) and “Asking the parent is enough because he’s a child. He can’t make decisions on his own just yet” (Interview 114–1, commenting on a 5-month old child), represented the perspectives that parents should retain decision making authority without the need for assent. Parents considered a child’s age and their ability to make an informed choice in thinking about whether they ought to be included in the decision. Representative responses included, “I think that depends on the age; if they are old enough to comprehend and make decisions on their own” (Interview 105–1) and “It depends on the child. Some kids are advanced at different ages, and some aren’t” (Interview 014–1). Parents also noted that the PICU setting was relevant to whether a child could be involved. Statements such as, “Sometimes the kids are not conscious. So, then it would just be the parents” (Interview 028-1), and “In a PICU setting, most of the time the child can’t answer for themselves. An adult is the only one that would probably be able to answer” (Interview 103-2), reflected the viewpoint that adolescent involvement might be constrained in the setting of critical illness. On univariate analyses, only prior PICU admissions were associated with a positive parental view of child assent (Fisher exact = 0.035) but we found no statistically significant predictors on multivariate analysis.

Sense of Ownership

A/YA expressed some sense of ownership over their donated samples ranging from a desire to know what would be done with their samples, to being aware of and involved in decisions to use their samples in the future and a preference to know research results. Questions such as, “What way is it going to help other children? What ways are they going to use my extra stuff?” (Interview 107) and “What would they be testing it for?” (Interview 105) reflected interest in knowing how their samples would be used. Others wanted to be alerted when their samples were used, responding, “There should be somebody to let me know what is going on” (Interview 104), and “If it was my blood that was used, I think I should be notified” (Interview 071). Some statements indicated a preference to participate in the decisions about future sample use, “I would say leave it up to the kids. I think parent involvement would be okay in some cases” (Interview 120), while others responded that patients should not be involved in these decisions, because, “people just honestly are not [educated enough] to make those kinds of decisions” (Interview 039). Adolescents and young adults both expressed interest in reconsent at the age of majority, agreeing that if their samples were obtained when they were a child they would want to be able to decline participation later. One YA spontaneously commented that reconsent, or at least an opportunity to opt out, would be ideal, “I mean just send a mass email like generic format so that it’s not directed at one person, but Hey! You are an adult now and we were just wondering if your samples are available for use” (Interview 120). Finally, respondents expressed a desire to know the results of research conducted with samples from the biobank, commenting: “If you find other diseases in my whatever samples, I would like to know about that” (Interview 056) and “if something was wrong with me, I would like to know that” (Interview 107). In contrast, responses like “it will somehow come back to hurt me in a way, like they will find something and then require you to have to get something” (Interview 022) and “[T]hey don’t have to tell me everything they find because it might scare me or something” (Interview 123) suggested that some felt knowledge of personal results could also be harmful.

Discussion

We found that A/YA with recent critical illness had positive attitudes towards research in general and biobanking in particular. Most A/YA wanted to be included in the decision to participate, and had a general idea of the purpose and process of a biobank. However, both adolescents and young adults lacked a deeper understanding of biobanks, including potential privacy risks. We also found that A/YA had a range of perspectives about use of samples, ranging from a desire to be informed about sample use, to wanting to be included in decisions about using their biospecimens. Given that comprehension among A/YA was low across key consent elements, including the purpose, procedures, risks, and benefits of participation, specific efforts should be made to improve comprehension by A/YA.

Our study adds to the limited literature describing adolescent and young adult comprehension and perspectives on biobanking. Hens et al. conducted focus groups with teenagers to learn their perspectives about biobanking. They found that adolescents placed trust in their parents to make decisions about the use of their samples for research and thought that their parents were best situated to make the decisions. Adolescents agreed that participants should be contacted when they reached the age of majority to provide informed consent for continued use of their samples. (Hens, Nys, Cassiman, & Dierickx, 2011) Murad et al. interviewed 18 adolescents between 15 and 17 years of age regarding their perspectives on biobank participation. The group found that most adolescents did not have prior knowledge of biobanks and had misconceptions regarding biobanks despite attempts at education. Additionally, they found that most adolescents had positive attitudes towards research and did not spontaneously raise concerns regarding privacy or other risks. Adolescents desired to be aware of and engage in decisions regarding biobank participation. For adolescents that could not provide assent, participants felt that reconsenting at the age of majority was important and that samples should not be shared prior to obtaining consent. (Murad, Myers, Thompson, Fisher, & Antommara, 2017) Both of these prior studies recruited relatively healthy participants, from outpatient clinic settings and schools. Our study is consistent with these prior studies and adds the unique perspective of adolescents and young adults who had recently been critically ill.

Our findings regarding sample use are also in line with reported adult preferences regarding use of their samples collected during childhood. (Goldenberg, Hull, Botkin, & Wilfond, 2009) A/YA also wanted an opportunity to opt-out or re consent once they reached the age of majority. One YA suggested email as a method to reach out to large numbers of individuals, although no one commented on how research teams could retain contact information over time. Operationalizing re consent for a pediatric population therefore remains an area for further study. A/YA had mixed views about receiving research results, from a strong preference to receive information about their own health or disease status, to concerns that such knowledge could be frightening or harmful. These findings support previous work that return of results is highly personal and a universal approach may not meet all participant's needs. (Fossey et al., 2018)

As with prior studies, A/YA in our study group generally wanted to be asked for permission to participate in a biorepository, while parents were split on whether children should be

included in this decision. Factors relevant to assent in other contexts, including age, maturity, and ability to understand and manipulate information were raised in both parent and patient responses on the proper role for A/YA. Additionally, as only 20% of adolescents participated in decisions regarding sample use, future work should be directed at improving involvement of A/YA in these decisions. Such work should further explore the impact of critical illness on participation by A/YA, as results from our model suggest that adolescent autonomy was constrained by obtaining consent at the time of PICU admission. Further exploring parent and adolescent views on the timing of consent and assent may provide an opportunity to improve A/YA participation.

Although this study adds to the paucity of literature on A/YA views on biobanking, several important limitations must be noted. The sample size of A/YA in this study was small. The high acuity of the PICU population and inability of many patients to communicate preferences in an ill state should be considered when conducting future studies, as this was a barrier to enrollment for some patients. This was a single center study, further limiting generalizability. Future studies should include multiple centers and a larger A/YA population. While our response rate was consistent with other studies enrolling in the intensive care setting, approaching A/YA at some interval following admission may increase their ability to participate in the decision about donating samples to the biorepository. Finally, as this was our first study evaluating perspectives on biobanking, we focused on general perspectives and did not address some ethically important and challenging questions, such as what should be done with samples in the event of a patient's death. This topic should be explored in future work.

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Appendix 1. PICU Biobank Consent

A BioBank is a storage system for left over body fluids or tissue samples (known as **biological samples**) that can be stored (like money in a **bank**) and used for research that helps scientists learn new information about medical problems. When blood is drawn or other samples are taken as part of usual medical care, there is often leftover material. This material may contain cells, proteins, and DNA – the body’s genetic material. Normally, after the tests are done, extra material is thrown away. At Children’s Hospital, we can store this extra material in a BioBank. Researchers can then use the BioBank for research to try to improve health for all children. Any researchers who want to use the BioBank must be approved by an advisory group managing the BioBank made up of doctors, scientists, nurses, parents and community members. The group will ensure that the goals and process of the research are in keeping with the mission of our Children’s Hospital.

If you allow your child’s sample (or your sample, if you are the patient) to be included in the Children’s BioBank, it will be stored securely. Information from the medical record will also be stored. The sample and the medical information are coded, which means they are not marked with the name or medical record number. This means that researchers using the Biobank cannot identify your/your child's sample from all the other samples. So, even if researchers discover relevant information, they WILL NOT be able to contact you or your child to let you know.

If you or your child decide at any point that you no longer want to participate in the BioBank, the Biobank managers can have the sample removed. To have a sample removed, contact the BioBank managers in writing at biobank@childrenshospital.org. Due to the large number of samples, the BioBank managers are not able to contact every child when he/she turns 18 to ask for permission to continue using his/her sample.

Please check a box and sign the line below to let us know if we can include your child's materials (your materials, if you are the patient) in the BioBank. Your choice will not affect your/your child's medical care:

- ☐ I AGREE to have my/my child's materials included in the BioBank
- ☐ DO NOT include my/my child's materials in the BioBank

Signature of Parent or
Legal Authorized Representative (LAR)

Relationship to child

RETURN THIS FORM TO THE UNIT SECRETARY.

This portion of the form is for PICU staff only

- ☐ Non-English/Non-Spanish Speaking ☐ Declined to complete ☐ Use Previous Response

Appendix 2. Visual Aid for Adolescents/Young Adults

When you're in the hospital, nurses and doctors sometimes take blood to do tests. They also take fluids like urine or spit to check on what's making you sick. Many times, after the tests, there is left over material. Normally, it just gets thrown away.

Scientists can use this material to do research to try to figure out why kids and adults get sick. Sometimes they learn things about how to make them better. They do this by looking at genes and other things in that leftover material.

The scientists can do research for a long time when they keep the extra material in freezers and treat it very carefully.

Best Practices

As biospecimen research continues to expand, investigators and institutional review boards should ensure that consents for biospecimen research are clear in their description of purpose, procedures, risks and benefits. Attempts should be made to involve adolescents in the decision regarding storage of biospecimens for research whenever possible and further exploration should be undertaken regarding adolescent perspectives on return of results. Timing of consent in acute and critical care settings should also be carefully considered.

Research Agenda

As our findings may vary by study setting, future research should include adolescents and young adults in other health care settings and in a larger sample to confirm the findings we present here. Additional research should be directed at how to better include adolescents and young adults in decisions regarding participation and how to improve comprehension of biospecimen research.

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Educational Implications

Data suggest that institutional review boards and investigators conducting biospecimen research should be aware that although individuals may be willing to participate in a biobank, understanding of what a biobank is and what research may be done with samples may be inadequate.

Figure 1.

Screening and Enrollment for Adolescent and Young Adult Participants

Response rate = $20/47 = 42.5\%$ among eligible adolescents and young adults. Response rate for corresponding parent interview study = $75/192 = 39.1\%$. Full parent screening and enrollment data is available from authors.

Table 1

Demographics

Characteristic	A/YA		Parents	
Gender	N=20	%	N=75	%
Female	13	65	56	75
Male	7	35	19	25
Age Range (y)				
12–17	15	75	0	0
18–29	5	25	20	27
30–49	0	0	50	67
50+	0	0	5	6
Education Level				
Grade School	4	20	4	5
HS/GED	12	60	19	25
Some College	4	20	19	25
Bachelors	0	0	14	20
Masters/Doctorate	0	0	19	25
Primary Language				
English	19	95	61	81
Spanish	1	5	12	16
Other	0	0	2	3
Ethnicity				
Hispanic/Latino	8	40	25	33
Not Hispanic/Latino	11	55	48	64
Unknown	1	5	2	3
Race				
White	11	55	39	52
Black	4	20	9	12
Asian	1	5	4	5
Other	3	15	22	29
Unknown	1	5	1	2
Insurance Type				
Public	7	35	37	49
Private	9	45	32	43
Both	2	10	5	7
Unknown	2	10	1	1
PICU Length of Stay				
1–3 Days	16	80	57	76
4–7 Days	3	15	12	16
10+ Days	1	5	6	8

Characteristic	A/YA		Parents	
Gender	N=20	%	N=75	%
PICU Intervention *				
Yes	9	45	27	36
No	11	55	48	64
Previous PICU Admission				
Yes	7	35	34	45
No	13	65	41	55

* PICU interventions included: Invasive Mechanical Ventilation, Noninvasive mechanical ventilation, Invasive line placement (venous or arterial), Dialysis, Vasoactive support, and Cardiopulmonary Resuscitation (CPR)

Table 2

Perspectives on Patient Involvement in a PICU Biobank

Domain	Representative Interview Guide Question†	Themes	Example Statements
Understanding	What do you think a gene is? (A)	Understanding of genetic research	A gene is like a specific thing in your body that kind of identifies you and the different things about you. (056 - A) Genes are what makes up a cell. We are learning all about genes in Biology. Genes are what makes up the cells and what parts you get from your father and mother. Basically, they are a part of the cell. (095 - A)
	What is your understanding of why this research is being done? (YA)	Biobank Purpose and Procedures	You will be able to use the rest of the samples leftover from blood, urine, and other stuff for research. (097 - YA)
Perspectives on Participation	What, if any, benefits do you see related to your participation? (YA)	Altruism	There is research being done lately that requires blood and tissue, and the only way to get it is to volunteer. This will help other children in the future who are in need of cures and medicine. (035 - YA) It feels good because I can help other people (122 - A) I think if it's helpful that's ok. If it can help them get better, it's necessary (105 - A)
	How do you feel about participating in research that is not going to help you specifically? (A)		
		Positive Attitudes Towards Biobanking	I think [the biobank] is a good thing to help find cures. (022 - A)
	What do you think about the scientists keeping your extra material to do research later? (A)		I think it's a good way for scientists to learn more about how to cure diseases and stuff (123 - A)
		Neutral	It doesn't really affect me so (119 - A) <i>How do you feel about scientist keeping your extra materials?</i> – Normal (117 - A)
Sense of Ownership		Information needed for assent decision	What way it is going to help other children? What ways are they are going to use my extra stuff? (107 - A) Like what are they looking for? Why are they using it? Maybe, what do they find? (123 - A)
	Does it bother you that the scientists cannot report back to you about what they find? Why or why not? (A) What concerns, if any, did you have about the information you received? (YA)	Return of Results	If it was my blood that was used, I think I should be notified [when researchers request to use samples]. (071 - YA) I think it's helpful but at the same time if something was wrong with me I would like to know that (107 - A) If you find other diseases in my samples, I would like to know about that. (056 - A)

Domain	Representative Interview Guide Question†	Themes	Example Statements
	<p>If your parents gave permission when you were little, and they told you about it when you got older, would you want there to be a way for you to decide not to be part of the research anymore? (A)</p> <p>What do you think would be the best way to handle a child's samples once he or she becomes an adult? (YA)</p>	Re-consenting	I mean just send a mass email like generic format so that it's not directed at one person, but Hey! You are an adult now and we were just wondering if your samples are available for use. (120 - YA)
Assent	Is asking a parent's permission enough or should we also ask the child or adolescent what they want? Why or why not? (P)	Parent View - Negative	[I] think that asking the parent is sufficient because I do not think they [children] can make an informed decision. (005-1 - P)
		Parent View - Positive	I would say it depends on the kid's age. For a baby, obviously, the parent. I don't have a good range but maybe like around 12 it kind of starts to be when they could give some input too. (054-1 - P)
	What do you think about us asking your parents to give permission? (A)	Patient view	Ask me along with my parents. (087 - A) <i>Would you like to be asked permission too? Yes. Why so? Because it's my body (105 - A)</i>

* The numbers and letters in parentheses following each sample statement refer to interview numbers and type of respondent, A = adolescent, YA = young adult, P = parent.

† Sample questions are included here. All interviewers were trained to probe for details where necessary to ensure complete responses.

Table 3

Young Adult Comprehension of Opt-In Consent

SSCI Question *	Average (n=5)
Purpose	0.9
Procedures	0.9
Risks	1
Benefits	1.1
Choice to	
Participate	2
Choice to	
Withdraw	1.9
Total	7.8

* SSCI = Semi-Structured Comprehension Interview. The total possible score for each question is 2, where a score of 0 reflects an incorrect response, a score of 1 reflects an incomplete or vague response, and a score of 2 reflects complete understanding.