Appendix 1: Canadian Surgical Bone Banks

#	Surgical Bank or Program	Contact
1	Royal Jubilee Hospital, Capital Health Region Tissue Bank, Victoria	Dr. Brian Berry Capital Health Region Tissue Bank Director of Hematopathology RJH Diagnostic & Treatment Centre 5th Floor – 1952 Bay Street Victoria British Columbia V8R 1J8 Ph. (250) 370-8000 - hospital switchboard Pager # for Dr. Berry is (250) 388-1798
2	Vancouver General Hospital, Vancouver	Mr. Ivan Yan Head Technologist BC Eye & Tissue Bank VGH/UBC Eye Care Centre on the 3rd floor 2550 Willow Street Vancouver, BC V5Z 3N9 Phone: (604) 875-4111 Fax: (604) 875-5316
3	**Southern Alberta Tissue Program**: Alberta Children's Hospital, Foothills Medical Centre, Peter Lougheed Hospital, Rockyview General - CGY	Southern Alberta Tissue Program (SATP) Foothills Medical Center Room 1002, South Tower 1403 29th Street NW Calgary, Alberta, Canada T2N 2T9 Ph: 403-944-1232 Fx: 403-944-3340
4	**The Comprehensive Tissue Centre**: Misericordia Hospital, Royal Alexandra, U of A - Edmonton	Dr. Jonathan Lakey, Director Jonathan.lakey@ualberta.ca University of Alberta Hospital Room 5B2.02 8440-112 Street

#	Surgical Bank or Program	Contact
		Edmonton, Alberta T6G 2B7 Ph: 780-407-7510 Fx: 780-407-7509
5	Regina General Hospital, Regina	Regina General Hospital 1440 - 14th Avenue Regina, SK S4P 0W5 Phone: (306) 766-4444 OR Manager
6	Royal University Hospital, Saskatoon	Transfusion Medicine Kerry Gorkoff Lab Manager - Diane Hogroute Royal University Hospital, 103 Hospital Drive - University of Saskatchewan Saskatoon, Saskatchewan, Canada S7N OW8 Phone (306) 655-2163 Fax (306) 655-2222 Phone (306) 655-2187
7	Toronto East General Hospital, Toronto	Dr. Pam DaCamara, Chief of Labs Phone: 416 – 469-6367 Email: pdaca@tegh.on.ca 825 Coxwell Avenue, H-Wing, 2nd flr. Toronto ON M4C 3EZ
8	Peterborough Regional Hospital, Peterborough	Dr. V.M. Walley, Chief Phone: 705 – 876 – 5014 Email: vwalley@prch.on.ca One Hospital Drive Peterborough ON K9J 7C6
9	Queensway Carleton Hospital, Neepean	Reine McGrath, Lab Manager Phone: 613-721-4700 ext 1023 Email: rmcgrath@qch.on.ca Donalda Fullerton Phone: 613-721-4726 Email: dfullerton@qch.on.ca 3045 Baseline Rd. Nepean ON K2H 8P4
10	The Hamilton Arthroplasy Bone Bank Hamilton Health Sciences, OR, Henderson Hospital	Debra Harrison, Technical Coordinator Phone: 905 – 389 –4411 ext 42755

#	Surgical Bank or Program	Contact
		711 Concession St., Hamilton ON l8V 1C3 CANADA harrideb@hhsc.ca
11	Transfusion Medicine Hamilton Regional Lab Medicine Program	Duane Boychuk, Manager Phone: 905-521-2100 ext 76281 Email: boychuk@hhsc.ca 50 Charlton Ave. Hamilton ON
12	St. Micheals Hospital, Toronto	Marjorie Henke R.N. Bone Bank Coordinator Phone: 416- 864-3036 Email: mhenke@smh.toronto.on.ca 30 Bond Street, Toronto, ON M5B 1W8
13	Sunnybrook & Women's College Health Science Centre, Toronto	Lisa Merkley, Supervisor Phone: (416) 480-6100 ext. 7391 Fax: (416) 480-4185 Email: lisa.merkley@sw.ca 2075 Bayview Avenue Toronto, ON M4N 3M5
14	Thunder Bay Regional Hospital, Thunder Bay	Bev Junnila, Technical Director 325 South Archibald Street Thunder Bay, ON P7E 1G6 Phone: 807-343-7018 Email: junnilab@TBH.net
15	Quinte Health Centre, Belleville General Hospital, Bellville	Sheila Cornwall, Coordinator 265 Dundas Street East Belleville ON K8N SA9 Phone: 613 – 969 – 7400 ext 2568 Email: scornwall@qhc.on.ca
16	London Health Sciences Centre, University Campus, London	Debbie Gaskin, Tissue, Organ and Cell Banking Specialist

#	Surgical Bank or Program	Contact
		Phone: (519) 685-8500 ext. 35061 Fax: (519) 663-3127 Email: Debbie.Gaskin@lhsc.on.ca University Campus, Rm 2SU20 339 Windermere Road London ON N6A 5A5
17	The Ottawa Hospital, Ottawa	Ms. Melanie Tokessey, Ms. Doris Neurath Transfusion Medicine The Ottawa Hospital, Civic Site 1053 Carling Ave Ottawa ON K1Y 4E9 Organ and Tissue Donation Program 613-761-4649
18	Brantford General Hospital, Brantford	Barry Vermeersch, Surgical Bone Bank – Laboratory Brantford General Hospital 200 Terrace Hill Brantford, Ontario N3R 1G9 (519) 751-5544
19	Kingston General Hospital, Kingston	Dr. Lois Shepherd Douglas Lab, Transfusion Medicine Douglas 2 Kingston General Hospital 76 Stuart St. Kingston ON K7L 2V7 (416) 549-6666 x 4166
20	Mount Sinai Hospital, Toronto	Coordinator - in - Chief / Director Rubinoff Bone and Tissue Bank Mount Sinai Hospital 600 University Ave, Suite 539 Toronto, Ontario M5G 1X5 phone 416-586-8870 fax 416-586-4458
21	Lakeridge Health Corporation, Oshawa	Lakeridge Health Corporation (Oshawa) 1 Hospital Court

#	Surgical Bank or Program	Contact
		Oshawa, Ontario L1G 2B9 Phone (905) 576-8711 Fax (905) 721-4848 Brenda Lynn – Director, Surgical Program
22	Sarnia General Hospital, Sarnia	Cathy Pitts – Surgical Program Director Sarnia General Hospital 220 North Milton Street Sarnia, ON N7T 6H6 (519) 464-4500
23	Hôpital du Sacré-Coeur de Montréal	Dr. Beaumont, Natalie Paradis #2140 Téléphone : (514) 338-2222 Télécopieur : (514) 338-2384 Hôpital du Sacré-Coeur de Montréal 5400, boul. Gouin Ouest Montréal, Québec (Canada) H4J-1C5
24	Jewish General Hospital	Anna Pavreil Sir Mortimer B. Davis Jewish General Hospital 3755 Cote Ste. Catherine Road Montreal, Quebec, Canada H3T 1E2 Tel: (514) 340-8222 Fax: (514) 340-7510
25	Lakeshore General Hospital	Dr Daoust (514) 694-5798. 160 Stillview Pointe-Claire (Québec) H9R 2Y2 Telephone : (514) 630-2225 (please note: Dr Daoust will only participate in written surveys) FAX the questions to him at 514-694-3610.
26	Moncton City Hospital, Moncton	Nicolle Ouellette Tissue Services Coordinator

#	Surgical Bank or Program	Contact
		Moncton City Hospital Bone Bank South East Health Corporation 135 MacBeth Ave Moncton, NB E1C 6Z8 Phone506-870-2556 Fax 506-857-5261 Niouelle@sehcc.health.nb.ca

Appendix 2: Issues Identified During Orthopaedic Department and Surgical Bone Bank Interviews

#	Donation	Banking	Utilization	Other Issues Identified
	All issues were raised by at least one bone bank or orthopaedic department interviewed. Issues are not referenced to a particular bone bank in order to maintain confidentiality. Literature review references are intended to support and expand on or investigate issues raised during the interviews.			
1	Accuracy of donation potential estimates – how accurate are the THR estimates?[Galea 1998, CIHI 2004]	Which banking model best fits the Canadian situation? Local, regional (e.g. Aho 1998) or centralized administration (e.g. Galea 1998	Surgeon preference - product and service must match U.S. tissue banks (McGraw 2005)	**Technology Issues** Biologic-bone combination products increasing in use (JBJS 2002)
2	180 day follow up testing – loss rate due to [Galea 1998]	Is there a role for the teaching hospitals to take the lead? E.g. to lead the development of a 'leading edge' or 'world class' surgical bone program? (McGraw 2005)	Canadian products must be user-friendly for the surgeon (McGraw 2005)	Increase in hip resurfacing techniques may lead to major decline in femoral heads if technology is widely adopted
3	180 day follow up testing – alternatives (i.e. cadaveric tests)	Is there an educational possibility with orthopaedic technologists – e.g. certificate in bone banking? http://www.pappin.com/csot/	Are there other Canadian models that can be used as benchmarks (e.g. Blood System)	May be able to better maximize tissue use by simply halving or quartering femoral heads before packaging – an entire head will not be wasted in a procedure that does not need it

#	Donation	Banking	Utilization	Other Issues Identified
4	Rejection Criteria variation between banks (e.g. bacterial infection not a universal reason for rejection) [Galea 1998]	Accreditation of surgical bone banks differs – some meeting CSA and others AATB – how or will this effect cooperation or regional/centralized planning?	Increasing number of procedures in many areas of orthopaedics: e.g. foot and ankle, impaction grafting (see CIHI report)	May be able to maximize use of storage equipment by simply halving or quartering femoral heads before packaging
5	Screening – timing varies by bank (i.e. some accept all FH's then screen, some screen first – any advantage?) [LaPrairie 1991]	Is it better to encourage the growth of more banks or increase the size of existing banks?	Rate of revision THR may be increasing faster than THR (CIHI)	**Clinical Issues** Total hip replacements occurring in younger patients – the need for revisions will increase and be needed earlier than before (Graham 2004)
6	Screening – role of CSA, AATB – can/should screening be standardized [CSA 2002, AATB 2002, 2004]	Where can the funding come from to expand surgical bone banking?	Demand estimates show a large shortfall in surgical and other bone tissue (CIHI)	No perception in clinical difference between deceased and fresh-frozen
7	Screening – role of CSA, AATB – is there a preference for AATB?	Can small (e.g. <75 femoral heads) surgical bone banks exist and still meet Health Canada requirements? Is there a small bank "success" that can be used as an example?	Improvements in bone products may actually be contributing to the shortage – the products	**Surgeon Preference** Irradiated tissue may not meet with surgeon preference

#	Donation	Banking	Utilization	Other Issues Identified
			are becoming more widely accepted in many orthopaedic surgeries and there is greater demand than supply	
8	Notification – bone banks are not being notified of all potential donors (it can be done however given the advanced scheduling of THR's– see Galea 1998)	Information sharing – are accredited/CSA compliant banks willing to share information and best practices to help encourage increased surgical bone banking?	Increasing number of Canadian surgeons have some training in US – may be building a preference for US bone graft products (CIHI)	Is surgeon preference the overriding factor in the acceptance and increase in Canadian surgical bone supply
9	Regional participation in the form of femoral heads shipped to central banks not the norm in Canada (exception SATB) – some international examples of this working (Aho 1998)	Can CCDT take a the lead in education for new/existing banks that need help establishing compliant systems?	There are problems with use of allograft surgeries that are increasing the use of bone substitutes (JBJS Mar 2005)	Surgeons, particularly in teaching hospitals, may have a preference for surgical bone
10	Identification of participating and potential bone banks – where are they and how could participation be	Bank processing differences – some use irradiation and others do not – is there a benefit to standardizing all procedures in Canada?	Increasing use of limb salvage procedures (particularly in children) with very high	Surgeons will use tissue other than surgical bone or will use substitutes if surgical bone is not available

#	Donation	Banking	Utilization	Other Issues Identified
	increased?		usage of allograft (McGraw 2005)	
11	Low orthopaedic department participation: Only ~35 of ~170 orthopaedic departments are contributing to a bank - why?	Operations – are there opportunities for consolidation of services between surgical bone banks and deceased banks?	Surgeon ultimately responsible for utilization choice – they will choose the best mix of ease of use, availability and patient outcome regardless of source (McGraw 2005)	**Testing Issues** 180 day follow up – this is not possible with cadaveric testing; Introduction and availability of Nucleic Acid testing may address this difference and ensure the same or greater safety
12	Can the non-contributing orthopaedic departments be encouraged to participate? Either through banking or through shipping?	Increasing banking activities creates pressure on other hospital departments – e.g. pathology (McGraw 2005)	Surgical bone banking falling out of use because it is not a necessity like it was before the appearance of highly developed US product (McGraw 2005)	Fresh-freezing may not kill all cells (Weytz 2003) – is there a way to make irradiation more acceptable (e.g. for DBM)
13	What is the 'true' cost of surgical bone banking? i.e. how are donation costs tracked?	Some banks "stand-alone" while at least one is trying to develop a larger procurement area having smaller centres just ship femoral heads to a larger	Whatever model is used, it must be able to demonstrate an 'overall departmental	Range of differences in rejection results between surgical bone banks across

#	Donation	Banking	Utilization	Other Issues Identified
		central bank (smaller centres then receive processed bone back at cost recovery)	benefit' (McGraw 2005)	Canada (35-65%) – is this a urban-rural issue?
14	Are the 'gates' or 'critical control points' for establishing or participating in surgical bone banking that are uneconomical for increasing participation?	Some banks acting as supply centres for orthopaedic departments that could be collecting and shipping	Knee revisions are also increasing, which may use an entire whole femoral head and also chips to fill deficits in tibia (McGraw 2005)	**When tissue is accepted for storage** Difference in when tissue is accepted – some banks accept all tissue, then screen, others only after screening
15	Can donation be increased by just getting orthopaedic departments to ship?– if they cant collect and ship they certainly will not be able to bank	High willingness stated from largest banks to explore ways of accepting surgical bone for processing from small orthopaedic departments	Utilization forecasting difficult for banks to do – e.g. depends on types of surgeries being performed	**Standards Issues** Some banks AATB accredited and others CSA compliant – what problems could this cause for participation or co-operation?
16	Purchasing power – surgeon is the buyer but not the payer – possible disconnect between surgeon preference and payers	High reliance on other orthopaedic departments, comprehensive banks and US for surgical bone (~140 hospitals)		Greater regulations may close more of the smaller banks
17	Cost of meeting the standards not	Increasing reliance on US Banks (CIHI at least 20% of		Some AATB accredited

#	Donation	Banking	Utilization	Other Issues Identified
	well established for surgical bone banks (see notes on AATB costs)	CDN supply)		banks feel that CSA standard not good enough and not as safe as AATB
18	What are the costs of not conducting surgical bone banking – e.g. financial and political aspect of reliance on the U.S.	Some banks considering other tissue like spinal tissue		One former bank expressed that banking is now 'too risky' from a liability point of view
19	Are there benefits to not conducting surgical bone banking?	Major differences in how surgical bone banks track development and operational costs		**Cost Issues** Cost difference between what a comprehensive bank can provide a safe femoral head (1000-1100 CDN) and what surgical bone banks tracked charges are (may be as low as $350-400)
20	Surgeon involvement – what would encourage their increased participation?	What is the 'true' cost of surgical bone banking? i.e. how are banking costs tracked?		Cost to just package, screen and serology test ~$200 – could be shipped at that point
21	What geographic model best suits the current	Lack of accurate financial information about costs of surgical bone banking		Cost to buy a femoral head, at today's

#	Donation	Banking	Utilization	Other Issues Identified
	Canadian system? What model best suits increased surgical bone banking? (e.g. local, regional or centralized)			exchange rate (1.25) as high as $1500 CDN
22		Disconnect with surgical bone budgets – i.e. budget to buy the bone different from operating a bone bank – may be hard to show a direct cost benefit due to different payers		Under funding of some bone banks, while large volume of US purchases occurring (may be as high as 20% from US (CIHI)
23		Cost of meeting the standards not well established for surgical bone banks (see notes on AATB costs)		
24		Can some of the costs of surgical bone banking really be considered “free” or not have to be tracked? (i.e. surgeon or OR staff time in procurement)		
25		Product quality – can competitive product to the US be produced by surgical bone banks? Can Canadian CTB’s produce the product from surgical bone?		

Appendix 3: Themes in Surgical Banking Issues

Themes	Issue Number in Appendix 2
Donation	
Estimating Supply/Donation Potential	[D1,D8]
Screening (history, consent)	[D10, D11, D12]
Banking	
Reliance on U.S. banks	[B16, B17]
Funding	[B6]
Product Quality	[B25]
Utilization	
Increase in use of procedures using allograft	[U4, U5, U6, U10, U14, U15]
Problems with human allograft	[U9]
Other	
Bone substitutes & alternate techniques	[O1, O2, O5]
Common Themes (i.e. appears in at least 2 areas)	
Surgeon Involvement	[D20]
Surgeon Involvement	[B2, B3]
Surgeon preference	[U1, U2, U7, U8, U11, U12]
Surgeon Preference	[O6, O7, O8, O9, O10]
Operational Models	[B5, B7, B8, B10, B11, B13, B14, B15, B18]
Operational models	[U13]
Operations	[O14]
Cost & Purchasing	[D13, D14, D16, D17, D18, D19]
Cost	[B19, B20, B21, B22, B23, B24]
Cost & Purchasing	[O19, O20, O21, O22]
Geographic models	[D21]
Geographic models	[B1]
Geographic models	[U3]
Donation area	[D9, D15]
Testing	[D2, D3, D4]
Testing	[O11, O12, O13]

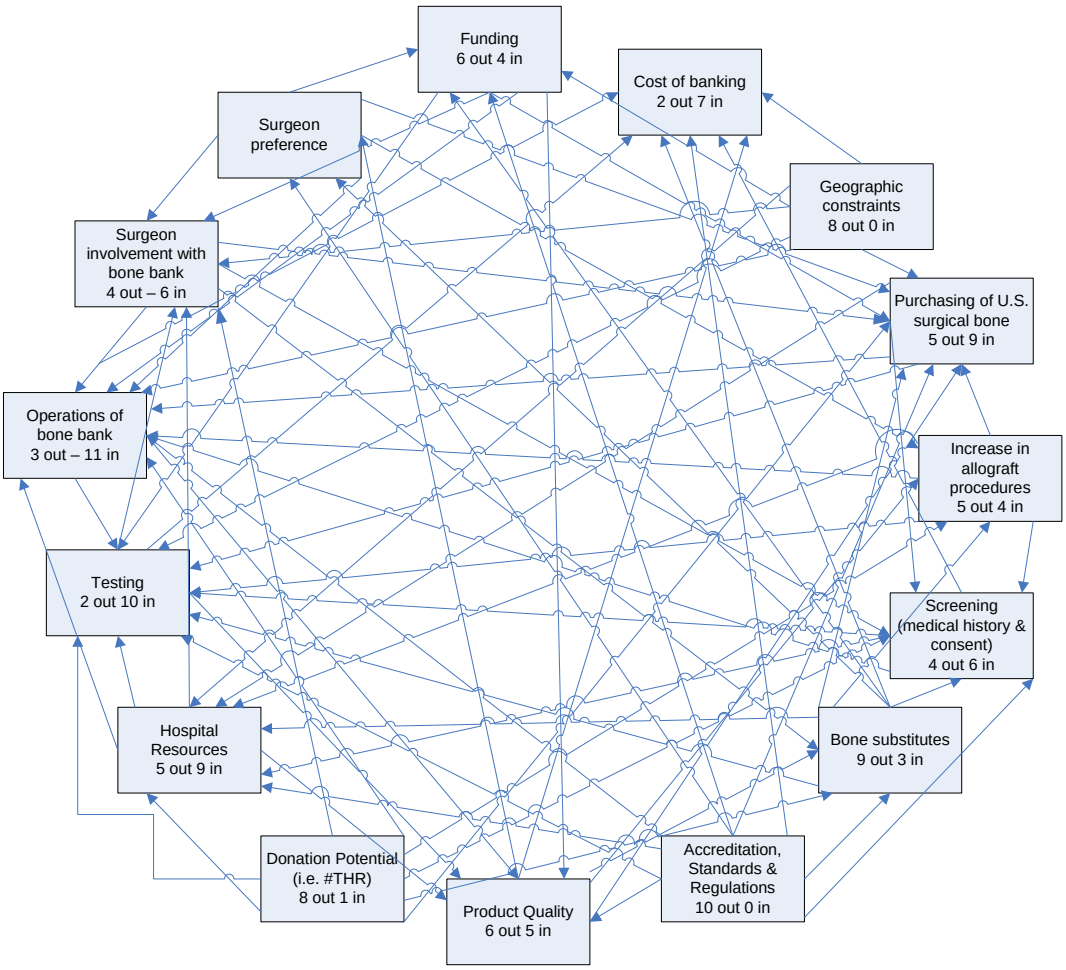
Accreditation, Standards & Regulations	[B4, B9]
Accreditation, Standards & Regulations	[O15, O16, O17, O18]
Effect on other hospital resources	[B12]
Maximizing current resources	[O3, O4]

Appendix 4: Interrelationship Diagraph and Decisions

Figure 1: Interrelationship Diagraph – Surgical Bone Banking Issues

Q1: Is there a cause of influence between two issues?

Q2: If yes, indicate with an arrow pointing out of the issue with the greater influence



Drivers	Outcomes
Accreditation, Standards and Regulations	Operations of a bone bank
Use of Bone Substitutes	Testing Requirements
Geographic Constraints	Human Resources
Donation Potential	Purchasing of US Surgical Bone
Surgeon Preference	Cost of Surgical Bone Banking
Funding	Surgeon Involvement in Surgical Bone Banking
Product Quality	Screening Requirements
Increase in Allograft Procedures	

Decision process for Surgical Bone Banking Interrelationship Diagraph

Initial Theme or Issue	Influence or Causal Relationship	Other Themes or Issues	Decision Reason
Surgeon Involvement with bone bank	Has an influence on	Operations	Must have surgeon involvement to operate bone bank
	Is influenced by	Testing	Surgeon required to perform tasks for testing requirements (e.g. biopsy)
	Is influenced by	Other Hospital Resources	Need participation of other hospital resources (e.g. pathology, blood bank)
	Is influenced by	Donation Potential	No THR supply, no surgical bone banking
	Is influenced by	Product Quality	If “US style” products are preferred, may be little incentive to be involved
	---	Accreditation, Standards & Regulations	
	Has an influence on	Bone Substitutes	Increased surgeon involvement in a bone bank may reduce use of substitutes
	Has an influence on	Screening (medical history and consent)	Increased surgeon involvement in a bone bank may reduce use of other staff required for screening
	---	Increase in allograft procedures	
	Has an influence on	Purchasing of Surgical Bone from US	If a surgeon involved in local bank may have less preference for US products
	Is influenced by	Geographic Constraints	Surgeons outside of major centres may not have infrastructure to participate in a bank
	---	Cost of Banking	
	Is influenced by	Funding	Surgeons outside of major centres may not have funding participate in a bank
	Is influenced	Surgeon	If US product is preferred, may

Initial Theme or Issue	Influence or Causal Relationship	Other Themes or Issues	Decision Reason
	by	Preference	not have incentive to be involved in local bank
Operations of bone bank	Has an influence on	Testing	Operations will influence the number and type of tests performed
	Is influenced by	Hospital Resources	Bank tests influence other departments (e.g. pathology)
	Is influenced by	Donation Potential	Cannot have bank operations without THR's
	Has an influence on	Product Quality	Bank capabilities directly effects product quality
	Is influenced by	Accreditation, Standards & Regulations	Has potentially largest effect on the operations of a bank
	Is influenced by	Bone Substitutes	Increased use of bone substitutes lessens need for bone banks operations
	Is influenced by	Screening (medical history and consent)	Screening can have an effect on operations – e.g. better medical history screening leads to lower bank rejection rates
	Is influenced by	Increase in allograft procedures	Operations will be effected by increase in demand for tissue
	Is influenced by	Purchasing of US surgical bone	Increased purchasing from US lowers need to local banks
	Is influenced by	Geographic constraints	Bone banks are effected by the geographic area that surgical bone is collected from (e.g. 180 day follow up – higher loss in rural areas)
	Has an influence on	Cost of banking	Optimized operations will lower costs
	Is influenced by	Funding	Must have funding to operate
	Is influenced by	Surgeon Preference	Surgeon preference for surgical bone drives need for bank
Testing	Is influenced	Hospital	Need the participation and

Initial Theme or Issue	Influence or Causal Relationship	Other Themes or Issues	Decision Reason
	by	Resources	cooperation of a number of departments – e.g. pathology, blood bank
	Is influenced by	Donation Potential	An increase in THR means an increase in the amount of surgical bone that needs to be tested
	Has an influence on	Product Quality	Products need thorough testing, and needs to also be 'up to date'
	Is influenced by	Accreditation, Standards & Regulations	These influence the kind of tests required
	Is influenced by	Bone Substitutes	Increased use of bone substitutes will decrease the number of tests required
	Is influenced by	Screening	Thorough medical history will screen out unviable heads
	Is influenced by	Increase in allograft procedures	An increase in procedures means an increase in testing
	Is influenced by	Purchasing of US surgical bone	Increased purchasing from the US means fewer tests required in Canada
	Is influenced by	Geographic constraints	E.g. 180 day follow up tests higher in rural areas than urban centres
	Has an influence on	Cost of banking	Increase in number and type of tests directly effects banking costs
	Is influenced by	Funding	Funding will determine number of femoral heads possible, which effects the number of tests required
	---	Surgeon preference	
Hospital Resources	Is influenced by	Donation Potential	An increase in THR requires use of more hospital resources
	Has an influence on	Product Quality	Level of processing depends on hospital resources available
	Is influenced	Accreditation,	Standards and Regulations a

Initial Theme or Issue	Influence or Causal Relationship	Other Themes or Issues	Decision Reason
	by	Standards & Regulations	main factor in the closing down of many hospital bone banks
	Is influenced by	Bone substitutes	Increasing the use of bone substitutes means fewer hospital resources needed
	Is influenced by	Screening	Increased screening requires more participation by e.g. nurse practitioners
	Is influenced by	Increase in allograft procedures	Increasing the number of procedures requires more hospital resources
	Is influenced by	Purchasing of US Surgical Bone	If US bone purchased decreases need for hospital resources
	Is influenced by	Geographic constraints	Outside of major centres may not have the resources to conduct surgical bone banking
		Cost of banking	Surgical bone banking dependent on the cost of procedures in other department
	Is influenced by	Funding	Funding determines resources available
	Is influenced by	Surgeon preference	Surgeon preference will determine resources – e.g. preference for US graft will lessen need for surgical bone bank
Donation Potential	---	Product Quality	
	---	Accreditation, Standards & Regulations	
	Has an influence on	Bone substitutes	If the demand for femoral heads exceeds supply will be increased reliance on substitutes
	Has an influence on	Screening	Increase in surgical bone donation will require more screening
	Has an	Increase in	If surgical bone donation

Initial Theme or Issue	Influence or Causal Relationship	Other Themes or Issues	Decision Reason
	influence on	allograft procedures	decreases will be more difficult to perform increasing number of allograft procedures
	Has an influence on	Purchasing of US surgical bone	If the demand for femoral heads exceeds supply will be increased reliance on US surgical bone
	Is influenced by	Geographic constraints	Greater procurement in urban centers
	---	Cost of banking	
	---	Funding	
	---	Surgeon preference	
Product Quality	Is influenced by	Accreditation, Standards & Regulations	Standards determine quality level to major extent
	Has an influence on	Bone substitutes	Risks of human allograft material one of the drivers for increased use of substitutes
	---	Screening	
	Has an influence on	Increase in allograft procedures	Safer and wider range of products has contributed to greater use of allograft
	Has an influence on	Purchasing of US surgical bone	Wider range of quality products available in the US
	---	Geographic constraints	
	Has an influence on	Cost of banking	Increased product quality will increase banking costs
	Is influenced by	Funding	Funding will determine extent of products possible
	Has an influence on	Surgeon preference	If similar products are not available in Canada surgeons will by preferred product elsewhere
Accreditation, Standards & Regulations	Has an influence on	Bone substitutes	Clinical outcomes of substitutes must meet the same regulations
	Has an influence on	Screening	Effects screening protocols
	---	Increase in allograft	

Initial Theme or Issue	Influence or Causal Relationship	Other Themes or Issues	Decision Reason
		procedures	
	Has an influence on	Purchasing of US surgical bone	Larger number of compliant suppliers of graft material in the US
	---	Geographic constraints	
	Has an influence on	Cost of banking	e.g. cost of meeting AATB standards
	Has an influence on	Funding	Need increased funding to meet standards (e.g. development of new SOP's)
	Has an influence on	Surgeon preference	Surgeons will choose safest product (McGraw 2005)
Bone substitutes	Has an influence on	Screening	Increased use of substitutes lessens need for screening
	Has an influence on	Increase in allograft procedures	Increasing supply of substitutes helping to allow increase in allograft procedures
	Has an influence on	Purchasing of US surgical bone	Increasing supply of substitutes will decrease demand for surgical bone
	---	Geographic constraints	
	Has an influence on	Cost of banking	Increasing supply of substitutes will decrease need for surgical bone – may in fact increase costs due to lesser economy of scale
	Has an influence on	Funding	Increasing supply of substitutes will funding of surgical bone banks
	Has an influence on	Surgeon preference	Greater and possibly safer options for surgeons
Screening	Is influenced by	Increase in allograft procedures	Increasing demand for allograft will require more surgical bone screening
	Is influenced by	Purchasing of US surgical bone	Greater purchasing from the US decreases need for screening in Canada
	---	Geographic constraints	

Initial Theme or Issue	Influence or Causal Relationship	Other Themes or Issues	Decision Reason
	Has an influence on	Cost of banking	More effective screening can reduce the cost of tests and other banking procedures
	---	Funding	
	---	Surgeon preference	
Increase in allograft procedures	Has an influence on	Purchasing of US surgical bone	Increase in procedures requires more bone tissue
	---	Geographic constraints	
	---	Cost of banking	
	---	Funding	
	Is influenced by	Surgeon preference	Surgeons able to more procedures
Purchasing of US surgical bone	Is influenced by	Geographic constraints	US products easy to access
	Is influenced by	Cost of banking	Costs for surgical bone banking not well established, and US is viewed as a cost effective alternative by some hospitals
	Is influenced by	Funding	Budgets are available for purchasing bone – may not be a direct connection with the budget to operate a surgical bone bank
	Is influenced by	Surgeon preference	Surgeons have it as an option and are using it
Geographic constraints	Has an influence on	Cost of banking	Lower rejection rate in urban centres than rural – need to collect lower numbers of femoral heads to obtain the same amount of viable surgical bone
	Has an influence on	Funding	More funding available in larger centres (e.g. teaching hospitals)
	---	Surgeon preference	
Cost of banking	Has an influence on	Funding	Costs determine level of funding required

Initial Theme or Issue	Influence or Causal Relationship	Other Themes or Issues	Decision Reason
	---	Surgeon preference	
Funding	---	Surgeon preference	
Surgeon preference	Has an influence on	Funding	E.g. if orthopaedic department willing to participate and prefers surgical bone funding may be obtained

Appendix 5: Canadian Surgical Bone Bank Cost Survey

Participation Required for Survey: Cost Estimate of Obtaining Surgical Bone

Survey background

The following survey lists the typical steps that occur for obtaining surgical bone from femoral heads acquired during total hip replacements, along with the current known costs estimates associated with each step. You will be asked to indicate your current costs, if known, or to provide an estimate of your current costs based on previous published costs associated with surgical bone banking. Peak Consulting has been contracted by the Canadian Council on Donation and Transplantation (CCDT) to conduct a cost benefit analysis of surgical bone banking in Canada. Your participation is required to gain a more accurate estimate of the costs of surgical bone banking in Canada.

Why your participation is required

There is currently no accurate estimate of the costs of surgical bone banking in Canada. The costs reported below are based on a very small number of published surgical banking costs – your participation is essential to gain an accurate cost of obtaining surgical bone in Canada.

Sharing of information from the survey

Once the responses have been collected, the average costs will be shared with the participating banks so that they have a benchmark to use for their own costing and budgeting purposes. Only the average costs of the banks participating in the survey will be reported to CCDT.

Confidentiality

YOUR SPECIFIC BONE BANK COSTS WILL NOT BE REPORTED TO CCDT OR ANY OTHER ORGANIZAION OR INDIVIDUAL . YOUR FACILITY WILL NOT BE IDENTIFIED IN ANY COST REPORTS.

ALL faxed responses will be destroyed once the responses have been collected. Responses will be destroyed by June 15, 2005.

For more information on CCDT, this survey or Peak Consulting please contact:

Ryan Kanigan
Peak Consulting
(604) 831-6352
ryan@peakconsulting.ca

OR

Debbie Gaskin, MLT
Tissue, Organ & Cell Banking Coordinator – London Health Sciences Centre
(519) 685-8500 Ext. 35061
Debbie.Gaskin@lhsc.on.ca

Thank you for your participation.

PLEASE **FAX** THE COMPLETED SURVEY TO: **(604) 434-6355** ATTN: Ryan

Facility:_____

Approximate # Surgical Bone Femoral Heads Obtained / year:_____

Typical Femoral Head Donation Steps	**Average Cost per femoral head**	**Description**	**Your Facility Cost Estimate** **Please indicate cost if known, *or* Circle an Estimated Cost Based on the Average**
Medical History Screening & Obtaining Consent	$30	**Typical steps:** Medical history screening, obtaining consent 1 hour (based on average RN wage)	Known cost_____ *Or* Estimated cost_____ *Or* ❒ costs not tracked
Initial swabs and serology	$130	**Typical current tests:** hepatitis B surface antigen; hepatitis B total core IgM antibody; hepatitis C antibody; HIV antibody; HIV I & II;HTLV I & II; syphilis serology;aerobic bacteria anaerobic bacteria thioglycolate; rapid plasma reagin	Known cost_____ *Or* Estimated cost_____ *Or* ❒ costs not tracked
Future testing requirements	$100	West Nile	Known cost_____ *Or* Estimated cost_____ *Or* ❒ costs not tracked
Procurement Femoral head removed	none	Part of total hip replacement (THR)	These costs are typically regarded as part of the costs of

Typical Femoral Head Donation Steps	**Average Cost per femoral head**	**Description**	**Your Facility Cost Estimate** **Please indicate cost if known, *or*** **Circle an Estimated Cost Based on the Average**
Excess tissue removed by surgeon or OR stag	Not reported	Part of total hip replacement (THR)	the THR – please indicate if your facility tracks costs for the these steps as part of surgical bone banking costs ❒ costs tracked if tracked, approx. cost_____ ❒ costs not tracked
Soft tissue sent for microbiology testing	none	Part of total hip replacement (THR)	
Other tissue sample sent to pathology	none	Part of total hip replacement (THR)	
Femoral head swabbed for microbiological testing OR staff places femoral head in screw top container (double bagged prior to storage) Antibiotic solution added Sizing measurement OR staff completes documentation (documentation copy stays with femoral head) Packaged femoral head removed from sterile OR – placed in foam container with ice or refrigerator for immediate storage Bone bank manager notified *If initial tests negative*, Femoral	$366	Please note: these costs are for the time for OR staff (other than surgeons) to complete the typical procurement steps performed while in the OR Test costs listed above – this is for the staff time cost of performing the step	These costs are also often regarded as part of the costs of the THR – please indicate if your facility does not tracks costs Known cost_____ *Or* Estimated cost_____ *Or* ❒ costs not tracked

Typical Femoral Head Donation Steps	Average Cost per femoral head	Description	Your Facility Cost Estimate Please indicate cost if known, *or* Circle an Estimated Cost Based on the Average
head transported to -80C freezer			
Materials	$15 $15 $10 $40 total	Container and bags for femoral head storage Swabs Antibiotic storage solution	Known cost_____ *Or* Estimated cost_____ *Or* ❒ costs not tracked
Storage	$67	**Typical steps:**180 day quarantine in freezer This would include the capital or rental costs and utilities to run the freezer $67 based on $5000 rent and utilities, for 75 viable femoral heads per year	Known cost_____ *Or* Estimated cost_____ *Or* ❒ costs not tracked
180 day testing	$130 $30	Identical to initial tests performed 1 hour staff time to locate patient records and arrange for testing	Known cost_____ *Or* Estimated cost_____ *Or* ❒ costs not tracked
Quality Assurance	$177	**Typical steps:** development and maintenance of procedures; internal auditing; accreditation	Known cost_____ *Or* Estimated cost_____

Typical Femoral Head Donation Steps	Average Cost per femoral head	Description	Your Facility Cost Estimate Please indicate cost if known, *or* Circle an Estimated Cost Based on the Average
		maintenance; equipment monitoring	*Or* ❒ costs not tracked
Final Distribution	$30	**Typical steps:** records check; arrange for shipping; packaging 1 hour staff time Adverse event reporting	Known cost_____ *Or* Estimated cost_____ *Or* ❒ costs not tracked

Some facilities track O.R. or other staff time as direct surgical bone bank costs and others do not. Given the kind of cost tracking that your facility performs, please circle where you think your costs are closest:

Our overall cost to obtain a viable femoral head is approximately:

$350 $500 $650 $800 $950 $1100

Current Capacity:

1) **Do you have the ability to bank more femoral heads that you currently do?**

   ❒ YES ❒ NO

   If Yes, approximately how many more would you estimate your facility could bank? (Number or percentage) _____

2) **If you were able to obtain more equipment for storage could you increase the number of femoral heads your bank retains?**

❒ YES ❒ NO

If Yes, approximately how many more would you estimate your facility could bank? (Number or percentage) _____

3) **Is there anything else you would need to increase the number of femoral heads your facility banks?**

Please indicate any other costs (e.g blood tests not listed here, other steps) that your facility incurs that were not listed in the steps above, and approximate costs if known.

Other Items	**Approximate Cost**

<u>THANK YOU FOR YOUR PARTICIPATION</u>

Appendix 6: Sample US Tissue Pricing

Pacific Coast Tissue Bank

A Non-Profit Organization

2005 FEE SCHEDULE FOR FREEZE DRIED TISSUE

ITEM #	STANDARD ORDER	LENGTH	WIDTH	VOLUME	FEE
1	FEMORAL SEGMENT	6 cm			$500.00
2	MANDIBLE				$2,200.00
2A	HEMI - MANDIBLE				$1,100.00
3	TIBIAL SEGMENT	6 cm			$500.00
5	FIBULA SEGMENT	5 - 7 cm			$360.00
5A	FIBULA SEGMENT	8 - 12 cm			$500.00
5B	FIBULA RING	6 - 14 mm			$250.00
6	CORTICAL BONE STRIP	6 cm	15 - 20 mm		$300.00
6A	CORTICAL BONE STRIP	20 cm	15 - 20 mm		$600.00
11	CORTICAL MATCHSTICKS	6 cm			$300.00
11A	CORTICO - CANCELLOUS MATCHSTICKS	3 - 6 cm			$300.00
14	CHIPS CANCELLOUS			30 cc	$450.00
16	CHIPS CANCELLOUS			15 cc	$300.00
17	CHIPS CORTICAL			15 cc	$250.00
18	CHIPS CORTICO - CANCELLOUS			30 cc	$350.00
19	CHIPS CORTICO - CANCELLOUS			15 cc	$250.00
20	ILIUM BLOCK	20 - 30 mm	10 - 15 mm		$250.00
21	ILIUM STRIP	40 - 50 mm	10 - 15 mm		$400.00
22	CANCELLOUS BLOCK	20 - 30 mm	10 - 15 mm		$350.00
23	CANCELLOUS STRIP	40 - 50 mm	10 - 15 mm		$600.00
24B	ILIUM WEDGE	20 - 30 mm	8 - 15 mm		$500.00
25	ILIUM DOWEL (BI - CORTICAL)		12,14, 16,18 mm		$400.00
26	BONE DOWEL (UNI - CORTICAL)		12,14, 16,18 mm		$400.00
30	PATELLA - TIBIAL LIGAMENT				$900.00
31	FASCIA LATA STRIP			per square cm	$4.00
32A	ACHILLES TENDON WITH BONE PLUG				$600.00
33A	FEMORAL HEAD WITH NECK				$1,000.00
34	FEMORAL HEAD, HALF				$600.00
36	TIBIA SHAFT	7 - 15 cm			$700.00
36A	TIBIA SHAFT	16 - 30 cm			$1,200.00
36B	TIBIA PROXIMAL	16 - 30 cm			$1,800.00
37	FEMUR SHAFT	7 - 15 cm			$700.00
37B	PROXIMAL FEMUR (SHAFT AND TROCH.)	16 - 30 cm			$1,800.00
37C	FEMUR SHAFT	16 - 30 cm			$1,200.00
38B	DISTAL FEMUR (SHAFT AND CONDYLES)	16 - 30 cm			$1,800.00
42	ACETABULUM				$1,500.00
43	RIB	6 cm			$300.00
43A	RIB	7 -15 cm			$500.00
44	RIB SPLIT, ONE HALF	6 cm			$200.00
44A	RIB SPLIT, ONE HALF	7 -15 cm			$400.00
45	COSTAL CARTILAGE				$350.00

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Community Tissue Services

A DEPARTMENT OF COMMUNITY BLOOD CENTER

www.dccb.org

MAIN OFFICE
[illegible]

BRANCHES
[illegible]

COMMUNITY TISSUE SERVICES

2005 FEE SCHEDULE (NP)

DESCRIPTION	SIZE	FEE
Fascia	101 - 150 Sq. cm	$521
Fascia	151 - 200 Sq. cm	$638
Fascia	201 - 250 Sq. cm	$790
Femoral Head w/o Cartilage		$878
Femoral Head, Hemi		$458
Femur Shaft < 11.0 Cm		$673
Femur Shaft > 11.0 Cm		$918
Femur Shaft, Split		$918
Femur Shaft, Split (1)		$450
Femur, Distal		$2,166
Femur, Prox. with Head		$2,223
Femur, Prox. w/o Head		$1,521
Femur, Ring		$304
Femur, Whole		$3,978
Femur, Whole w/o Head		$3,276
Fibula, Distal		$737
Fibula, Proximal		$737
Fibula, Ring		$257
Fibula, Segment <= 5 cm		$351
Fibula, Segment 6-10 cm		$468
Fibula, Segment 11+ cm		$585
Fibula, Whole		$537
Ilium, Hemi		$1,404
Ilium, Whole		$1,968
Mandible, Hemi		$1,483
Mandible, Whole		$2,681
Matchsticks	.5 X .5 cm	$363
Matchsticks, Ilium	.5 X .5 cm	$363
Patellar Lig w/Quad Bloc		$1,404
Patellar Lig., Bloc		$1,404
Patellar Ligament		$2,106
Patellar Ligament w/Quad		$2,106
Patellar Wedge		$468
Radius, Ring		$257
Radius, Segment		$468
Radius, Proximal		$737
Radius, Distal		$737
Rib	1.0 - 3.0 cm	$263

Appendix 7: Additional Survey Results

Some facilities track O.R. or other staff time as direct surgical bone bank costs and others do not. Given the kind of cost tracking that your facility performs, please circle where you think your costs are closest:

Our overall cost to obtain a viable femoral head is approximately:

$350 n=1
$500
$650 n=1
$800
$950 n=2
$1100 n=1
Overall cost not known n=6

Current Capacity:

4) **Do you have the ability to bank more femoral heads that you currently do?**

Yes: n=8 No: n=3

100 to 200% more

100% (n=3) more

50% to 100% more (n=2)

Not sure n=2

5) **If you were able to obtain more equipment for storage could you increase the number of femoral heads your bank retains?**

Yes: n=4 No: n= 7

10% increase: n=1

100% increase: n=1

200% increase: n=1

Not sure: n=1

6) **Is there anything else you would need to increase the number of femoral heads your facility banks?**

- Space
- Staff
- Commitment from surgeons
- funding

Please indicate any other costs (e.g blood tests not listed here, other steps) that your facility incurs that were not listed in the steps above, and approximate costs if known.

Other Items	**Approximate Cost per Femoral Head**
Sterilizing	$200
20% loss of product after investment of capital	$180
Irradiation (bank #8)	$1300 per 6 heads = $217
Irradiation (bank #11)	$225 per head
Irradiation (bank #12)	$200 per head
Blood culture	$20
Biopsy of bone	$100