

Autologous Tissue Management Evidence Table
Recommendation I

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Ahangari, Z., Alborzi, S., Yadegari, Z., Dehghani, F., Ahangari, L., & Naseri, M. (2013). The effect of propolis as a biological storage media on periodontal ligament cell survival in an avulsed tooth: An in vitro study. <i>Cell Journal</i> , 15(3), 244-249.	Based on PDL viability, propolis could be recommended as a suitable biological storage media for avulsed teeth.	IIB	Quasi-experimental	Extracted teeth without any dental disease	Exposure to propolis 50%, propolis 10%, Hank's Balanced Salt Solution, milk, and egg white	Positive control: Dipase and collagenase/Negative control: Dry	60	Periodontal ligament cell viability
Al-Nazhan, S., & Al-Nasser, A. (2006). Viability of human periodontal ligament fibroblasts in tissue culture after exposure to different contact lens solutions. <i>Journal of Contemporary Dental Practice [Electronic Resource]</i> , 7(4), 37-44.	Contact lens solution is a good storage medium to maintain the viability of periodontal ligament fibroblasts for a short-term period.	IIC	Quasi-experimental	Periodontal ligament fibroblasts cultured from a healthy extracted impacted human tooth	Exposure to three different contact lens solutions	Exposure to culture medium	1	Viability and morphology of periodontal ligament cells
American Association of Endodontists. (2013). Recommended guidelines of the american association of endodontists for the treatment of traumatic dental injuries	Guidelines are provided for teeth already implanted, teeth that have been kept in special storage media, and teeth with an extra-oral dry time greater than 60 minutes.	IVC	Clinical practice guideline	Endodontists and other treating avulsed teeth	N/A	N/A	N/A	N/A
Andersson, L., Andreasen, J. O., Day, P., Heithersay, G., Trope, M., Diangelis, A. J., et al. (2012). International association of dental traumatology guidelines for the management of traumatic dental injuries: 2. avulsion of permanent teeth. <i>Dental Traumatology</i> , 28(2), 88-96.	The International Association of Dental Traumatology has developed a consensus statement after a review of the dental literature and group discussions. The guidelines represent the current best evidence and practice based on literature research and professionals' opinion.	IVB	Clinical practice guideline	Dentists and others treating avulsed teeth	N/A	N/A	N/A	N/A
Andreasen, J. O., Borum, M. K., Jacobsen, H. L., & Andreasen, F. M. (1995). Replantation of 400 avulsed permanent incisors. 4. factors related to periodontal ligament healing. <i>Endodontics & Dental Traumatology</i> , 11(2), 76-89.	Immediate replantation after brief cleansing in either tap water or saline is recommended.	IIIB	Nonexperimental	Avulsed and replanted teeth	Examination of various clinical factors	N/A	400	Pulpal revascularization
Baginska, J., & Wilczynska-Borawska, M. (2012). Knowledge of nurses working at schools in bialystok, poland, of tooth avulsion and its management. <i>Dental Traumatology</i> , 28(4), 314-319.	The knowledge of tooth avulsion in the population of nurses working in schools in Bialystok, Poland was at an appropriate level. There was a strong correlation between this level and the participation in the lecture on the management of dental trauma conducted 2 years before.	IIIB	Nonexperimental	School nurses in Bialystok, Poland	Survey	N/A	50	Knowledge about tooth avulsion
Ballal V, V J. Storage media. <i>Br Dent J</i> . 2011;211(4):153.	Author discusses use of contact lens solution, ricetrol, and green tea extract for transport media and cites supporting references.	VB	Expert opinion	Dentists and others treating avulsed teeth	N/A	N/A	N/A	N/A

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Brullmann, D., Schulze, R. K., & d'Hoedt, B. (2010). The treatment of anterior dental trauma. <i>Deutsches Arzteblatt International</i> , 108(34-35), 565-570.	Emergency facilities should keep a stock of tooth rescue boxes. Teeth should ideally be replanted in the alveolus immediately, or stored using an appropriate alternative method and then replanted at an appropriate specialized facility.	VB	Literature review	Dentists and others treating avulsed teeth	N/A	N/A	N/A	Treatment of children and adolescents with broken anterior teeth
Caglar E, Sandalli N, Kuscuoğlu OO, et al. Viability of fibroblasts in a novel probiotic storage media. <i>Dental Traumatology</i> . 2010;26(5):383-387.	It appears that the probiotic solution may be able to maintain the viability of periodontal ligament cells as well as the balanced salt, milk, or saline.	IIC	Quasi-experimental	Freshly extracted single-rooted human teeth	Exposure to Hank's Balanced Salt Solution, saline solution, milk, and <i>Lactobacillus reuteri</i> solution	Positive control: Dipase and collagenase/Negative control: Dry	36	Periodontal ligament cell viability
Ceallaigh, P. O., Ekanayake, K., Beirne, C. J., & Patton, D. W. (2007). Diagnosis and management of common maxillofacial injuries in the emergency department. part 5: Dentoalveolar injuries. <i>Emergency Medicine Journal</i> , 24(6), 429-430.	Prompt treatment is essential.	VB	Clinician experience	Dentists and others treating avulsed teeth	Description of personal treatment protocol	N/A	N/A	N/A
Chamorro, M. M., Regan, J. D., Opperman, L. A., & Kramer, P. R. (2008). Effect of storage media on human periodontal ligament cell apoptosis. <i>Dental Traumatology</i> , 24(1), 11-16.	The results indicated that at 24 and 72 hours, the periodontal ligament cells treated with Gatorade and contact lens solution displayed the highest percentage of apoptotic cells when compared with other treatment groups at room temperature.	IIC	Quasi-experimental	Primary periodontal ligament cell samples isolated from freshly extracted human teeth	Exposure of periodontal ligament cells to whole milk, reduced fat milk, Gatorade, and contact lens solution on ice	Exposure of periodontal ligament cells to whole milk, reduced fat milk, Gatorade, and contact lens solution at room temperature	24	Apoptosis of periodontal ligament cells
Chen, H., & Huang, B. (2012). (-)-Epigallocatechin-3-gallate: A novel storage medium for avulsed teeth. <i>Dental Traumatology</i> , 28(2), 158-160.	The (-)-epigallocatechin-3-gallate group had the highest percentage of cell viability, followed by Hank's Balanced Salt Solution, or milk for two hours.	IB	Randomized controlled trial	Freshly extracted single-rooted human teeth	Exposure of periodontal ligament cells to milk, Hank's Balanced Salt Solution, and green tea	Positive control: Fresh teeth/Negative control: Teeth allowed to dry for 8 hours	30	Periodontal ligament cell viability
Choi D, Badner VM, Yeroshalmi F, Margulis KS, Dougherty NJ, Kreiner-Litt G. Dental trauma management by new york city school nurses. <i>J Dent Child</i> . 2012;79(2):74-78.	There is a gap of knowledge in the ability of school nurses to handle dental trauma.	IIIB	Nonexperimental	School nurses in New York City	Survey	N/A	200	Knowledge and ability to manage and treat traumatic dental injuries
de Sousa, H. A., de Alencar, A. H., Bruno, K. F., Batista, A. C., & de Carvalho, A. C. (2008). Microscopic evaluation of the effect of different storage media on the periodontal ligament of surgically extracted human teeth. <i>Dental Traumatology</i> , 24(6), 628-632.	There was no statistically significant difference in the number of cells per mm ² between milk, egg white, or artificial saliva.	IIB	Quasi-experimental	Maxillary and mandibular molars extracted for orthodontic reasons	Exposure to milk, egg white, artificial saliva	Fixation in formalin	40	Periodontal ligament cell viability

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de Souza BD, Bortoluzzi EA, ad Silveira Teixeira C, Felipe WT, Simoes CM, Felipe MC. Effect of HBSS storage time on human periodontal ligament fibroblast viability. <i>Dental Traumatology</i> . 2010;26(6):481-483.	The storage time of balanced salt solution had a negative influence on its ability to maintain periodontal ligament fibroblast viability.	IIC	Quasi-experimental	Periodontal ligament fibroblasts cultures	Exposure to Hank's Balanced Salt Solution for varying time periods	Positive control: Minimum essential medium/Negative control: Tap water	672	Periodontal ligament cell viability
de Souza, B. D., Luckemeyer, D. D., Felipe, W. T., Alves, A. M., Simoes, C. M., & Felipe, M. C. (2012). Effect of milk renewal on human periodontal ligament fibroblast viability in vitro. <i>Dental Traumatology</i> , 28(3), 214-216.	At 24 hours, milk and minimum essential medium performed similarly. However, from 48 hours onwards, minimally essential medium was significantly better than renewed and not renewed milk at both temperatures. Regardless of temperature, renewal of milk with fresh milk did not affect its ability to maintain periodontal ligament fibroblasts.	IIB	Quasi-experimental	Periodontal ligament cell fibroblasts cultured from healthy third molar teeth	Exposure to milk that is renewed every 24 hours up to 120 hours	Positive control: Minimum essential medium/Negative control: Tap water	960	Periodontal ligament cell viability
de Vasconcellos, L. G., Brentel, A. S., Vanderlei, A. D., de Vasconcellos, L. M., Valera, M. C., & de Araujo, M. A. (2009). Knowledge of general dentists in the current guidelines for emergency treatment of avulsed teeth and dental trauma prevention. <i>Dental Traumatology</i> , 25(6), 578-583.	The results of the survey showed appropriate knowledge of dental avulsion management and its prevention among the surveyed dentists. The findings also showed that communication between dentists and the population is deficient.	IIIB	Nonexperimental	General dental practitioners in Sao Jose dos Compos, Brazil	Survey	N/A	260	Knowledge of dental avulsion management and its prevention
Doshi, D. (2009). Bet 3. avulsed tooth brought in milk for replantation. <i>Emergency Medicine Journal</i> , 26(10), 736-737.	Milk or special medium used for storage and transport of avulsed teeth improves the successful replantation rate.	VB	Expert opinion	Dentists and others treating avulsed teeth	N/A	N/A	N/A	N/A
Eskandarian, T., Badakhsh, S., & Esmaeilpour, T. (2013). The effectiveness of oral rehydration solution at various concentrations as a storage media for avulsed teeth. <i>Iranian Endodontic Journal</i> , 8(1), 22-24.	Oral rehydration solution might be a suitable storage medium for avulsed teeth.	IIB	Quasi-experimental	Periodontal ligament cells obtained from healthy extracted human premolars	Exposure to three different concentrations of oral rehydration solution for varying time periods	Culture medium	96	Periodontal ligament cell viability
Gjertsen, A. W., Stothz, K. A., Neiva, K. G., & Pileggi, R. (2011). Effect of propolis on proliferation and apoptosis of periodontal ligament fibroblasts. <i>Oral Surgery Oral Medicine Oral Pathology Oral Radiology & Endodontics</i> , 112(6), 843-848.	Propolis not only decreased apoptosis, but also increased the metabolic activity and proliferation of periodontal ligament cells. The results from this study suggest that propolis is a suitable storage medium for avulsed teeth.	IIB	Quasi-experimental	Human periodontal ligament fibroblast cell cultures	Exposure to various concentrations of propolis	Exposure to Hank's Balanced Salt Solution	96	Periodontal ligament cell viability
Gopikrishna, V., Thomas, T., & Kandaswamy, D. (2008). A quantitative analysis of coconut water: A new storage media for avulsed teeth. <i>Oral Surgery Oral Medicine Oral Pathology Oral Radiology & Endodontics</i> , 105(2), e61-5.	Within parameters of this study, it appears that coconut water may be a better alternative to Hank's Balanced Salt Solution or milk in terms of maintaining periodontal ligament cell viability after avulsion and storage.	IB	Randomized controlled trial	Freshly extracted human teeth	Exposure to cocnute water	Postive control: No exposure/Negative control: Dry	50	Periodontal ligament cell viability

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Goswami, M., Chaitra, T., Chaudhary, S., Manuja, N., & Sinha, A. (2011). Strategies for periodontal ligament cell viability: An overview. <i>Journal of Conservative Dentistry</i> , 14(3), 215-220.	Literature supports that moist storage appears to be a more productive approach to optimize periodontal ligament cell survival; however, no medium is idea and in vivo studies are inadequate.	VB	Literature review	Dentists and others treating avulsed teeth	N/A	N/A	N/A	Optimal storage for periodontal ligament cells to preserve viability
Huang SC, Remeikis NA, Daniel JC. Effects of long-term exposure of human periodontal ligament cells to milk and other solutions. <i>J Endod.</i> 1996;22(1):30-33.	Hank's Balanced Salt Solution was the best storage media. Milk is a good short-term storage medium for maintaining the viability of cells in vitro.	IIB	Quasi-experimental	Periodontal ligament cells cultured from healthy extracted human teeth	Exposure to milk, two types of contact lens solution, and saline,	Hank's Balanced Salt Solution	120	Periodontal ligament cell viability
Hugar, S. M., Suganya, M., Kiran, K., Vikneshan, M., & More, V. P. (2013). Knowledge and awareness of dental trauma among indian nurses. <i>International Emergency Nursing</i> , 21(4), 252-256.	The findings of the study revealed poor knowledge about emergency management of dental trauma.	IIIB	Nonexperimental	Nurses and student nurses from a nursing institute in Belgaum, India	Survey	N/A	300	Knowledge and awareness regarding emergency management of dental traumatic injuries
Hwang, J. Y., Choi, S. C., Park, J. H., & Kang, S. W. (2011). The use of green tea extract as a storage medium for the avulsed tooth. <i>Journal of Endodontics</i> , 37(7), 962-967.	Green tea extract could be a suitable, alternative storage medium for avulsed teeth.	IIB	Quasi-experimental	Human periodontal ligament cell cultures	Exposure to milk and two different green tea extracts	Positive control: Hank's Balanced Salt Solution/Negative control: Tap water	30	Periodontal ligament cell viability
Ize-Iyamu, I. N., & Saheeb, B. (2013). Reimplantation of avulsed dry permanent teeth after three days: A report of two cases. <i>Nigerian Journal of Clinical Practice</i> , 16(1), 119-122.	The teeth are still firm without complications after 7 and 17 months.	VC	Case report	Patients undergoing replantation of avulsed teeth after 72 hours	N/A	N/A	2	Successful replantation without complications after 7 and 17 months
Jung, I. H., Yun, J. H., Cho, A. R., Kim, C. S., Chung, W. G., & Choi, S. H. (2011). Effect of (-)-epigallocatechin-3-gallate on maintaining the periodontal ligament cell viability of avulsed teeth: A preliminary study. <i>Journal of Periodontal & Implant Science</i> , 41(1), 10-16.	The findings of the study showed that EGCG could maintain PDL cell viability of extracted teeth. These results suggest that although EGCG may not be a perfect additive for tooth preservation, it is able to postpone the period of tooth storage.	IIB	Quasi-experimental	Atraumatically extracted teeth from Beagle dogs	Exposure to culture medium containing green tea extract	Exposure to culture medium without green tea extract	30	Periodontal ligament cell viability
Karayilmaz, H., Kirzioglu, Z., & Erken Gungor, O. (2013). Aetiology, treatment patterns and long-term outcomes of tooth avulsion in children and adolescents. <i>Pakistan Journal of Medical Sciences</i> , 29(2), 464-468.	A high rate of success can be obtained when the avulsed teeth are kept under wet conditions and brought to a dental clinic as soon as possible.	IIIB	Nonexperimental	Patients referred to the Suleyman Demirel University because of a traumatic dental injury	Review of records related to causes and treatment	N/A	66	Causes and management protocols for avulsion injuries
Kargul, B., & Welbury, R. (2009). An audit of the time to initial treatment in avulsion injuries. <i>Dental Traumatology</i> , 25(1), 123-125.	A minority of avulsion injuries were seen within the first hour and a minority were in appropriate storage medium at presentation.	IIIB	Nonexperimental	Avulsion injuries in 75 children	Review of records related to treatment	N/A	120	Management of injury and storage medium used, if any

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Khademi, A. A., Saei, S., Mohajeri, M. R., Mirkheshti, N., Ghassami, F., Torabi nia, N., et al. (2008). A new storage medium for an avulsed tooth. <i>Journal of Contemporary Dental Practice [Electronic Resource]</i> , 9(6), 25-32.	Egg white could be suggested as a suitable storage medium.	IB	Randomized controlled trial	Healthy, permanent teeth extracted for orthodontic reasons	Exposure to egg white and milk	Postive control: Hank's Balanced Salt Solution/Negative control: Tap water	100	Periodontal ligament cell viability
Koca, H., Topaloglu-Ak, A., Sutekin, E., Koca, O., & Acar, S. (2010). Delayed replantation of an avulsed tooth after 5 hours of storage in saliva: A case report. <i>Dental Traumatology</i> , 26(4), 370-373.	The clinical and radiographic findings after two years revealed absence of root resorption, ankylosis, or mobility of the replanted tooth.	VB	Case report	8-year-old body whose avulsed tooth was kept in the oral cavity for five hours before replantation	N/A	N/A	N/A	Successful clinical and radiographic findings after two years
Krasner, P. (2010). Treatment of avulsed teeth by oral and maxillofacial surgeons. <i>Journal of Oral & Maxillofacial Surgery</i> , 68(11), 2888-2892.	If teeth can be placed in a storage medium such as Hank's Balanced Salt Solution, they can be replanted up to 24 ours later with little loss of success.	VB	Literature review	Dentists and others treating avulsed teeth	N/A	N/A	N/A	Treatment strategies for patients with avulsed teeth
Lin, S., Emodi, O., & Abu El-Naaj, I. (2008). Splinting of an injured tooth as part of emergency treatment. <i>Dental Traumatology</i> , 24(3), 370-372.	This easy-to-perform procedure can prevent later complications and morbidity.	VB	Clinician experience	Dentists and others treating avulsed teeth	Tooth fixation by suturing	N/A	N/A	N/A
Lin, S., Zuckerman, O., Fuss, Z., Ashkenazi, M., American Association of, E., International Association of Dental, T., et al. (2007). New emphasis in the treatment of dental trauma: Avulsion and luxation. <i>Dental Traumatology</i> , 23(5), 297-303.	When possible, the tooth should be replanted at the site of the accident. The preferred storage medium is milk for avulsed teeth.	VB	Clinician experience	Dentists and others treating avulsed teeth	Treatment for avulsion injuries	N/A	N/A	N/A
Loh, T., Sae-Lim, V., Yian, T. B., & Liang, S. (2006). Dental therapists' experience in the immediate management of traumatized teeth. <i>Dental Traumatology</i> , 22(2), 66-70.	More than hald (54.8%) were not sure of the optimal storage medium for avulsed teeth.	IIIB	Nonexperimental	School dental therapists in Singapore	Survey	N/A	167	Knowledge and experience on management of dental trauma
Macway-Gomez, S., & Lallier, T. E. (2013). Pedialyte promotes periodontal ligament cell survival and motility. <i>Journal of Endodontics</i> , 39(2), 202-207.	Pedialyte is a viable alternative as a storage solution for avulsed teeth.	IIB	Quasi-experimental	Periodontal fibroblasts gathered from patients with healthy gingiva and no periodontal disease who underwent extraction of impacted third molars	Exposure to Hank's Balanced Salt Solution, non-fat milk, coconut water, and Pedialyte for various time periods	Postive control: Culture medium containing fetal bovine serum/Negative control: Tap water	288	Periodontal ligament cell viability
Malhotra N. Current developments in interim transport (storage) media in dentistry: An update. <i>Br Dent J.</i> 2011;211(1):29-33.	Current research has indicated the use of few newer media as promising interim transport media for the treatment of avulsed teeth.	VB	Literature review	Dentists and others treating avulsed teeth	N/A	N/A	N/A	Storage medium for avulsed teeth

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Moazami, F., Mirhadi, H., Geramizadeh, B., & Sahebi, S. (2012). Comparison of soymilk, powdered milk, hank's balanced salt solution and tap water on periodontal ligament cell survival. <i>Dental Traumatology</i> , 28(2), 132-135.	Soymilk and powdered baby formula can be recommended as suitable storage media for avulsed teeth for up to eight hours.	IIB	Quasi-experimental	Human periodontal ligament fibroblast cell cultures	Exposure to soymilk, powdered milk, baby formula, and Hank's Balanced Salt Solution for varying time periods	Positive control: Dulbecco's modified Eagles's Medium/Negative control: Tap water	144	Periodontal ligament cell viability
Moradian, H., Badakhsh, S., Rahimi, M., & Hekmatfar, S. (2013). Replantation of an avulsed maxillary incisor after 12 hours: Three-year follow-up. <i>Iranian Endodontic Journal</i> , 8(1), 33-36.	After three years, the tooth is stable and remained functional and esthetically acceptable.	VB	Case report	12-year-old boy whose avulsed tooth was replanted 12 hours after the injury	N/A	N/A	N/A	Functional and aesthetically acceptable result after three years
Moreira-Neto JJ, Gondim JO, Raddi MS, Pansani CA. Viability of human fibroblasts in coconut water as a storage medium. <i>Int Endod J</i> . 2009;42(9):827-830.	The capacity of the storage media in maintaining human fibroblast cell viability in decreasing order was: milk > saline and coconut water with sodium bicarb > coconut water > still mineral water.	IIB	Quasi-experimental	Human fibroblasts cultured from human knee joint synovial fluid	Exposure to coconut water, coconut water with sodium bicarbonate, milk, saline, and mineral water	Positive control: Cells cultured in Eagle's Minimum Essential Medium/Negative controls: Pure storage media	672	Periodontal ligament cell viability
Moura, C. C., Soares, P. B., Reis, M. V., Fernandes Neto, A. J., & Soares, C. J. (2012). Soy milk as a storage medium to preserve human fibroblast cell viability: An in vitro study. <i>Brazilian Dental Journal</i> , 23(5), 559-563.	The results indicate that soy milk can be used as a more adequate storage medium for avulsed teeth. Skim milk was not as effective in preserving cell viability as the cell culture medium and soy milk.	IIB	Quasi-experimental	Cultured human mouth fibroblasts	Exposure to whole milk, skim milk, powdered milk, and soy milk	Positive control: Dulbecco's modified Eagles's Medium	200	Periodontal ligament cell viability
Mousavi B, Alavi SA, Mohajeri MR, Mirkheshti N, Ghassami F, Mirkheshti N. Standard oral rehydration solution as a new storage medium for avulsed teeth. <i>Int Dent J</i> . 2010;60(6):379-382.	Standard ORS is a suitable transport medium to support the maintenance of PDL cell viability.	IB	Randomized controlled trial	Young adult premolar teeth without periodontal disease	Exposure to oral rehydration solution	Positive control: Hank's Balanced Salt Solution/Negative control: Tap water	75	Periodontal ligament cell viability
Needleman HL, Stucenski K, Forbes PW, Chen Q, Stack AM. Massachusetts emergency departments' resources and physicians' knowledge of management of traumatic dental injuries. <i>Dental Traumatology</i> . 2013;29(4):272-279.	Educational campaigns are needed to improve both the resources available, and the knowledge of physicians regarding emergency management.	IIIC	Nonexperimental	Physicians in Massachusetts emergency departments	Survey	N/A	72	Knowledge and resources to manage avulsion injuries
Ozan F, Polat ZA, Er K, Ozan U, Deger O. Effect of propolis on survival of periodontal ligament cells: New storage media for avulsed teeth. <i>J Endod</i> . 2007;33(5):570-573.	10% propolis was a more effective medium than other groups and can be recommended as a suitable transport medium for avulsed teeth. Due to lack of availability, milk and Hands are first choice.	IIB	Quasi-experimental	Periodontal ligament cells cultured from healthy third molar teeth	Exposure to 10% propolis solution, 20% propolis solution, skim milk, and Hank's Balanced Salt Solution	Positive control: Hank's Balanced Salt Solution/Negative control: Tap water	10	Periodontal ligament cell viability

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Ozan, F., Polat, Z. A., Tepe, B., & Er, K. (2008). Influence of storage media containing salvia officinalis on survival of periodontal ligament cells. Journal of Contemporary Dental Practice [Electronic Resource], 9(6), 17-24.	Salvia officinalis can be recommended as a suitable transport medium for avulsed teeth.	IIB	Quasi-experimental	Periodontal ligament cells cultured from healthy third molar teeth	Exposure to various concentrations of <i>Salvia officinalis</i>	Positive controls: Hank's Balanced Salt Solution and Phosphate buffered saline/Negative control: Tap water	35	Periodontal ligament cell viability
Ozan, F., Tepe, B., Polat, Z. A., & Er, K. (2008). Evaluation of in vitro effect of morus rubra (red mulberry) on survival of periodontal ligament cells. Oral Surgery Oral Medicine Oral Pathology Oral Radiology & Endodontics, 105(2), e66-9.	Juice of the fruit of M. rubra can be recommended as a suitable transport medium for avulsed teeth.	IIB	Quasi-experimental	Periodontal ligament cells cultured from healthy third molar teeth	Exposure to various concentrations of <i>Morus rubra</i>	Positive controls: Hank's Balanced Salt Solution and Phosphate buffered saline/Negative control: Tap water	35	Periodontal ligament cell viability
Rajendran P, Varghese NO, Varughese JM, Murugaian E. Evaluation, using extracted human teeth, of ricetrol as a storage medium for avulsions--an in vitro study. Dental traumatology. 2011;27(3):217-220.	Statistical analysis revealed that cell vitality was high with Ricetrol and Hanks Balanced Salt Solution, but poor with milk.	IC	Randomized controlled trial	Fresh human teeth extracted for orthodontic purposes	Exposure to ricetrol and milk	Hank's Balanced Salt Solution	30	Periodontal ligament cell viability
Royal College of Surgeons. (rev. 2004). Treatment of avulsed permanent teeth in children	Guidelines are provided for initial management, and follow-up management.	IVB	Clinical practice guideline	Dentists and others treating avulsed teeth	N/A	N/A	N/A	N/A
Sanghavi, T., Shah, N., Parekh, V., & Singbal, K. (2013). Evaluation and comparison of efficacy of three different storage media, coconut water, propolis, and oral rehydration solution, in maintaining the viability of periodontal ligament cells. Journal of Conservative Dentistry, 16(1), 71-74.	The results of the study indicated that coconut water demonstrated a significantly higher number of viable periodontal ligament cells than propolis 50%, and oral rehydration solution. There was not significant difference between coconut water and propolis 50% groups.	IIB	Quasi-experimental	Human teeth with intact crowns extracted for orthodontic reasons	Exposure to coconut water, 50% propolis, and oral rehydration solution	Positive control: Dipase and collagenase/Negative control: Dry	40	Periodontal ligament cell viability
Saxena P, Pant VA, Wadhvani KK, Kashyap MP, Gupta SK, Pant AB. Potential of the propolis as storage medium to preserve the viability of cultured human periodontal ligament cells: An in vitro study. Dental Traumatology. 2011;27(2):102-108.	Combinations of propolis are equally good as storage media to keep cells alive during initial 24 hour period. Other more readily available media may be appropriate for shorter periods up to 12 hours.	IIB	Quasi-experimental	Human teeth from healthy individuals having no caries beyond the cemento-enamel junction and no periodontal disease	Exposure to various concentrations of propolis, Hank's Balanced Salt Solution, milk, and artificial saliva	Positive control: Dulbecco's Minimum Essential Medium	960	Periodontal ligament cell viability
Sigalas, E., Regan, J. D., Kramer, P. R., Witherspoon, D. E., & Opperman, L. A. (2004). Survival of human periodontal ligament cells in media proposed for transport of avulsed teeth. Dental Traumatology : Official Publication of International Association for Dental Traumatology, 20(1), 21-28.	Storage of an avulsed tooth on ice is more beneficial than storage at room temperature. Hank's Balanced Salt Solution is the optimal storage solution for avulsed teeth.	IIIC	Nonexperimental	Human teeth extracted because of clinical necessity	Exposure to milk, Hank's Balanced Salt Solution, three varieties of contact lens solution, and Gatorade at room temperature and on ice	Positive control: Dulbecco's Minimum Essential Medium/Negative control: Tap water	20	Periodontal ligament cell viability

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CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Silva, E. J., Rollemberg, C. B., Coutinho-Filho, T. S., Krebs, R. L., & Zaia, A. A. (2013). Use of soymilk as a storage medium for avulsed teeth. <i>Acta Odontologica Scandinavica</i> , 71(5), 1101-1104.	The present study shows the efficacy of soymilk in maintaining the viability of 3T3 fibroblasts is similar to that of Hank's Balanced Salt Solution and milk. Therefore, it may be concluded that soymilk could be a suitable storage medium for avulsed teeth.	IIB	Quasi-experimental	Periodontal ligament cell cultures	Exposure to milk, Hank's Balanced Salt Solution, soymilk, Gatorade, and egg white	Positive control: Dulbecco's Minimum Essential Medium/Negative control: Tap water	2304	Periodontal ligament cell viability
Sonoda, C. K., Poi, W. R., Panzarini, S. R., Sottovia, A. D., & Okamoto, T. (2008). Tooth replantation after keeping the avulsed tooth in oral environment: Case report of a 3-year follow-up. <i>Dental Traumatology</i> , 24(3), 373-376.	Three years of follow up revealed absence of root resorption, ankylosis or abnormal mobility, which demonstrates the feasibility of keeping avulsed teeth in saliva, at least when more indicated storage media are not immediately available.	VB	Case report	30-year-old female whose avulsed tooth was kept in her oral cavity until replantation 90 minutes following the avulsion	N/A	N/A	N/A	Successful clinical and radiographic findings after three years
Souza BD, Luckemeyer DD, Felipe WT, Simoes CM, Felipe MC. Effect of temperature and storage media on human periodontal ligament fibroblast viability. <i>Dental Traumatology</i> . 2010;26(3):271-275.	Incubation temperature altered the effectiveness of the storage media and skimmed milk at 20 C was better than Hank's Balanced Salt Solution in maintaining periodontal ligament fibroblast viability.	IIB	Quasi-experimental	Human periodontal ligament fibroblast cell cultures obtained from clinically healthy third molar teeth extracted for orthodontic reasons	Exposure to sterile and unsterile Hank's Balanced Salt Solution	Positive control: Minimum essential medium/Negative control: Tap water	960	Periodontal ligament cell viability
Souza, B. D., Luckemeyer, D. D., Reyes-Carmona, J. F., Felipe, W. T., Simoes, C. M., & Felipe, M. C. (2011). Viability of human periodontal ligament fibroblasts in milk, Hank's balanced salt solution and coconut water as storage media. <i>International Endodontic Journal</i> , 44(2), 111-115.	Skimmed and whole milk had the greatest capacity to maintain periodontal ligament fibroblast viability when compared with natural coconut water, Hank's Balanced Salt Solution, Save, industrialized coconut water, and tap water.	IIB	Quasi-experimental	Human periodontal ligament fibroblast cell cultures	Exposure to Hank's Balanced Salt Solution, skim milk, whole milk, and natural and industrialized coconut water	Positive control: Minimum essential medium/Negative control: Tap water	672	Periodontal ligament cell viability
Subramaniam P, Eswara U, Girish Babu KL, Vardhan B. Oral rehydration salt-liquid as an alternative storage medium—a preliminary study. <i>J Clin Pediatr Dent</i> . 2011;35(4):393-395.	The study found the Oral Rehydration Salt Liquid was an effective solution in maintaining the viability of periodontal ligament cells.	IC	Randomized controlled trial	Caries-free human premolars with normal periodontium and closed apices extracted for orthodontic reasons	Exposure to oral rehydration solution after a dry period of 30 minutes	Positive control: Collagenase/Negative control: Dry	20	Periodontal ligament cell viability

Autologous Tissue Management Evidence Table
Recommendation I

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Thomas, T., Gopikrishna, V., & Kandaswamy, D. (2008). Comparative evaluation of maintenance of cell viability of an experimental transport media "coconut water" with hank's balanced salt solution and milk, for transportation of an avulsed tooth: An in vitro cell culture study. <i>Journal of Conservative Dentistry</i> , 11(1), 22-29.	It appears that coconut water may be a better alternative to Hank's balanced salt solution or milk, in terms of maintaining viability. Coconut water can be used as a superior transport medium for avulsed teeth.	IIB	Quasi-experimental	Periodontal ligament cell cultures	Exposure to Hank's Balanced Salt Solution, milk, and coconut water	Positive control: Immediate dry/Negative control: 24 hour dry	120	Periodontal ligament cell viability
Udoe, C. I., Jafarzadeh, H., & Abbott, P. V. (2012). Transport media for avulsed teeth: A review. <i>Australian Endodontic Journal: The Journal of the Australian Society of Endodontology</i> , 38(3), 129-136.	Milk remains the storage medium of choice for avulsed teeth that cannot be replanted immediately or very soon after the avulsion.	VB	Literature review	Dentists and others treating avulsed teeth	N/A	N/A	N/A	Effective transport media for avulsed teeth
Ulusoy, A. T., Onder, H., Cetin, B., & Kaya, S. (2012). Knowledge of medical hospital emergency physicians about the first-aid management of traumatic tooth avulsion. <i>International Journal of Paediatric Dentistry</i> , 22(3), 211-216.	There is a need to improve the knowledge of emergency medical physicians regarding the emergency treatment for traumatic teeth avulsion injuries.	IIIB	Nonexperimental	Emergency medical physicians in Samsun, Turkey	Survey	N/A	28	Knowledge about managing traumatic tooth avulsion injuries
Yeng, T., & Parashos, P. (2008). An investigation into dentists' management methods of dental trauma to maxillary permanent incisors in victoria, australia. <i>Dental Traumatology</i> , 24(4), 443-448.	Overall, the respondents to this survey demonstrated only a moderate level of knowledge in management of traumatic injuries to maxillary permanent incisors in children. Continuing professional development programs may be a means of improving this deficient knowledge base.	IIIB	Nonexperimental	Dentists in Victoria, Australia	Survey	N/A	371	Knowledge of managing traumatic dental injuries to maxillary permanent incisors in children
Zhao, Y., & Gong, Y. (2010). Knowledge of emergency management of avulsed teeth: A survey of dentists in beijing, china. <i>Dental Traumatology</i> , 26(3), 281-284.	There is a need to improve the knowledge of dentists in emergency treatment of avulsed teeth.	IIIB	Nonexperimental	Dentists in urban and suburban areas of Beijing, China	Survey	N/A	258	Experience and knowledge related to managing dental traumas

Recommendation II

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
21 CFR 1271: Human cells, tissues, and cellular and tissue-based products.(April 2012).		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Albrektsson T, Johansson C. Osteoinduction, osteoconduction and osseointegration. Eur Spine J. 2001;10 Suppl 2:S96-101.	Osteoconduction: Growth of bone tissue into an implant or graft. Osteoinduction: Acceleration of new bone formation. Osseointegration: The structural and functional connection that develops between living bone and the surface of an implant.	VA	Expert opinion	Orthopedic surgeons	N/A	N/A	N/A	N/A
Baldo, S., & Tacconi, L. (2010). Effectiveness and safety of subcutaneous abdominal preservation of autologous bone flap after decompressive craniectomy: A prospective pilot study. World Neurosurgery, 73(5), 552-556.	This preliminary and limited experience provides evidence that the subcutaneous preservation of autologous bone flap is feasible.	IIIB	Nonexperimental	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Subcutaneous storage of bone flap in the patient's abdominal wall	N/A	12	Bone flap infection
Beez, T., Sabel, M., Ahmadi, S. A., Beseoglu, K., Steiger, H. -, & Sabel, M. (2013). Scanning electron microscopic surface analysis of cryoconserved skull bone after decompressive craniectomy. Cell and Tissue Banking, , 1-4.	Cryopreservation for up to 8 months does not appear to alter the surface structure of skull bone on scanning electron microscopy.	IIIC	Nonexperimental	Pieces of bone flap from patients treated with decompressive craniectomy who were unable to undergo subsequent cranioplasty	Evaluation of bone flap using scanning electron microscopy	N/A	5	Crack formation and morphologic changes in bone surface
Bhaskar IP, Yusheng L, Zheng M, Lee GY. Autogenous skull flaps stored frozen for more than 6 months: Do they remain viable?. Journal of Clinical Neuroscience. 2011;18(12):1690-1693.	Viable bone cells have not been demonstrated on human skull flaps which have been frozen for more than six months.	IIB	Quasi-experimental	Bone flaps stored at - 22° F (-30° C) for more than six months	Bone cultures	Fresh bone flaps	27	Bone cell viability
Bhaskar IP, Zaw NN, Zheng M, Lee GYF. Bone flap storage following craniectomy: A survey of practices in major australian neurosurgical centres. ANZ J Surg. 2011;81(3):137-141.	This study documented highly variable preservation and storage practices in neurological centers in Australia.	IIIC	Nonexperimental	Neurosurgical centers	Survey	N/A	25	Practices for cryopreservation and storage of skullll bone flaps

Recommendation II

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Bridwell KH, O'Brien MF, Lenke LG, Baldus C, Blanke K. Posterior spinal fusion supplemented with only allograft bone in paralytic scoliosis. does it work? Spine (Phila Pa 1976). 1994;19(23):2658-2666.	Allograft bone is a suitable substitute for autogenous bone graft in select patient with paralysis for whom using autogenous bone is not feasible.	IIIC	Nonexperimental	Patients with paralytic scoliosis treated with bilateral posterior segmental instrumentation, facet fusions, local bone graft, and allograft supplementation	Radiograph	N/A	40	Fusion success
Elwatidy, S., Elgamel, E., Jamjoom, Z., Habib, H., & Raddaoui, E. (2011). Assessment of bone flap viability and sterility after long periods of preservation in the freezer. Pan Arab Journal of Neurosurgery, 15(1), 24-28.	Preservation of bone flap in the freezer at -18° C is very simple, cheap, and safe, and is available in all facilities. Bone flaps stored using this technique remained viable and sterile for periods up to 12 months.	IIIC	Nonexperimental	Bone flaps stored at -0.4° F (-18° C) for more than six months	Microbiological and histological examination	N/A	14	Sterility and viability
Flannery, T., & McConnell, R. S. (2001). Cranioplasty: Why throw the bone flap out? British Journal of Neurosurgery, 15(6), 518-520.	Given the superior cosmetic result, preservation of the bone flap in the patient's abdominal wall may represent the best option for the patient.	VB	Clinician experience	Surgeons performing decompressive craniectomy and delayed cranioplasty	Subcutaneous storage of bone flap in the patient's abdominal wall	N/A	N/A	N/A
Food and Drug Administration. (2012). Current good tissue practice (CGTP) and additional requirements for manufacturers of human cells, tissues, and cellular and tissue-based products (HCT/Ps)		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Gibson S, McLeod I, Wardlaw D, Urbaniak S. Allograft versus autograft in instrumented posterolateral lumbar spinal fusion: A randomized control trial. Spine (Phila Pa 1976). 2002;27(15):1599-1603.	Allograft bone gives clinical results as least as good as autograft bone in instrumented posterolateral lumbar spinal fusion and avoids donor site complications.	IB	Randomized controlled trial	Patients undergoin instrumented lumbal spinal fusion	Autologous bone harvested from the iliac crest	Allograft bone	69	Clinical results and patient reports of pain
Gill K, O'Brien JP. Observations of resorption of the posterior lateral bone graft in combined anterior and posterior lumbar fusion. Spine (Phila Pa 1976). 1993;18(13):1885-1889.	No difference was noted between autograft and allograft fusion.	IIIC	Nonexperimental	Patients undergoing posterolateral bone graft and segmental instrumentation following severe postlaminectomy syndrome	Fused posterolateral grafts	Non-fused posterolateral grafts	30	Resorption of bone graft

Recommendation II

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Grossman N, Shemesh-Jan HS, Merkin V, Gideon M, Cohen A. Deep-freeze preservation of cranial bones for future cranioplasty: Nine years of experience in soroka university medical center. Cell & Tissue Banking. 2007;8(3):243-246.	Deep-freeze preservation of autologous bone grafts to reconstruct skull defects is a useful procedure and has a low revision rate.	VB	Organizational experience	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Subcutaneous storage of bone flap in the patient's abdominal wall	Cryopreservation and frozen storage of the bone flap	68	Clinical and aesthetic results
Human cells, tissues, and cellular and tissue-based products; establishment registration and listing. Federal Register. 2001;66(13):5447-5469.		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Inamasu, J., Kuramae, T., & Nakatsukasa, M. (2010). Does difference in the storage method of bone flaps after decompressive craniectomy affect the incidence of surgical site infection after cranioplasty? comparison between subcutaneous pocket and cryopreservation. Journal of Trauma-Injury Infection & Critical Care, 68(1), 183-187.	Subcutaneous pocket and cryopreservation may be equally efficacious for storage of bone flaps of non-traumatic brain injury etiology; however, subcutaneous pocket may be the storage method of choice for traumatic brain injury. Further research is warranted.	IIIB	Nonexperimental	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Subcutaneous storage of bone flap in the patient's abdominal wall	Cryopreservation and frozen storage of the bone flap	70	Surgical site infection
Iwama, T., Yamada, J., Imai, S., Shinoda, J., Funakoshi, T., & Sakai, N. (2003). The use of frozen autogenous bone flaps in delayed cranioplasty revisited. Neurosurgery, 52(3), 591-6; discussion 595-6.	The clinical and aesthetic results of delayed cranioplasty using frozen autogenous bone flaps were satisfactory. The most important factor for success was excellent contiguity between the flap and the bone edge.	IIIB	Nonexperimental	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Reconstruction with cryopreserved autologous bone flap	N/A	49	Clinical and aesthetic results
Jho DH, Neckrysh S, Hardman J, Charbel FT, Amin-Hanjani S. Ethylene oxide gas sterilization: A simple technique for storing explanted skull bone. technical note. J Neurosurg. 2007;107(2):440-445.	Data in this analysis support the effectiveness of the technique. Bone flaps preserved beyond 10 months should be discarded or resterilized.	IIIB	Nonexperimental	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Preservation of autologous bone flap by ethylene oxide	N/A	103	Aesthetic and functional results and infection
Joaquim, A. F., Mattos, J. P., Neto, F. C., Lopes, A., & de Oliveira, E. (2009). Bone flap management in neurosurgery. Revista Neurociencias, 17(2), 133-137.	It is not possible to state with statistically significant confidence if one method of bone flap management is superior to another.	VB	Literature review	Orthopedic surgeons and neurosurgeons	N/A	N/A	N/A	Consensus of literature related to preservation and management of bone flaps

Recommendation II

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Krishnan, P., Bhattacharyya, A. K., Sil, K., & De, R. (2006). Bone flap preservation after decompressive craniectomy--experience with 55 cases. <i>Neurology India</i> , 54(3), 291-292.	Subgaleal preservation of the patient's own bone flap is a suitable, easy, cheap, sterile, and histocompatible alternative with better physiological and cosmetic results than other techniques.	VC	Clinician experience	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Subcutaneous preservation of autologous cranial bone flap in the subgaleal space	N/A	74	Bone resorption
Lu, Y., Hui, G., Liu, F., Wang, Z., Tang, Y., & Gao, S. (2012). Survival and regeneration of deep-freeze preserved autologous cranial bones after cranioplasty. <i>British Journal of Neurosurgery</i> , 26(2), 216-221.	Reimplanted deep-freeze-preserved autologous cranial bone can survive in the short term and regenerate in the medium and long term.	IIIC	Nonexperimental	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Cryopreservation of bone flap and decontamination at the time of replantation	N/A	16	Postoperative infection or seroma
Matsuno, A., Tanaka, H., Iwamuro, H., Takanashi, S., Miyawaki, S., Nakashima, M., et al. (2006). Analyses of the factors influencing bone graft infection after delayed cranioplasty. <i>Acta Neurochirurgica</i> , 148(5), 535-40; discussion 540.	Autoclaved and autogenous bone grafts and polymethylmethacrylate have a significantly higher rate of graft infection. Titanium mesh has the significantly lowest rate of graft infection.	IIIB	Nonexperimental	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Reconstruction with cryopreserved and steam sterilized autologous bone flap	Reconstruction with polymethylmethacrylate	109	Infection
Morina, A., Kelmendi, F., Morina, Q., Dragusha, S., Ahmeti, F., Morina, D., et al. (2011). Cranioplasty with subcutaneously preserved autologous bone grafts in abdominal wall-experience with 75 cases in a post-war country kosova. <i>Surgical Neurology International</i> , 2, 72.	Storage of the patient's own bone flap in an abdominal pocket is a safe, each, cheap, sterile, histocompatible method that provides better cosmetic results.	VB	Case report	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Subcutaneous storage of bone flap in the patient's abdominal wall	N/A	82	Cosmetic appearance and infection rate
Movassaghi, K., Ver Halen, J., Ganchi, P., Amin Hanjani, S., Mesa, J., & Yaremchuk, M. J. (2006). Cranioplasty with subcutaneously preserved autologous bone grafts. <i>Plastic & Reconstructive Surgery</i> , 117(1), 202-206.	Subcutaneous storage preserves viability of portions of autogenous bone grafts. Cranioplasty performed with a subcutaneously preserved craniectomy graft has a low revision rate.	IIIC	Nonexperimental	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Subcutaneous storage of bone flap in the patient's abdominal wall	N/A	53	Infection and revision rate
Nasca RJ, Whelchel JD. Use of cryopreserved bone in spinal surgery. <i>Spine (Phila Pa 1976)</i> . 1987;12(3):222-227.	The use of cryopreserved, allogenic bone is comparable with autogenous bone.	IIIB	Nonexperimental	Patients undergoing spinal fusion	Fusion with cryopreserved autologous bone	Fusion with fresh autologous bone	152	Fusion success

Recommendation II

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Osawa, M., Hara, H., Ichinose, Y., Koyama, T., Kobayashi, S., & Sugita, Y. (1990). Cranioplasty with a frozen and autoclaved bone flap. <i>Acta Neurochirurgica</i> , 102(1-2), 38-41.	Deep-freezing and autoclaving had only minimal effects on bone structure, although osteocytes degenerated. Autogenous bone flap after deep-freezing is a useful material for cranioplasty, but sterilization before use is indispensable.	VB	Organizational experience	Patients undergoing cranioplasty	Reconstruction with cryopreserved autologous bone flap	N/A	27	Postoperative changes in bone structure
Pasaoglu, A., Kurtsoy, A., Koc, R. K., Kontas, O., Akdemir, H., Oktem, I. S., et al. (1996). Cranioplasty with bone flaps preserved under the scalp. <i>Neurosurgical Review</i> , 19(3), 153-156.	No complications were encountered with this technique in 27 cases.	IIIC	Nonexperimental	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Subcutaneous storage of bone flap in the patient's abdominal wall	N/A	27	Postoperative complications
Prolo, D. J., Burres, K. P., McLaughlin, W. T., & Christensen, A. H. (1979). Autogenous skull cranioplasty: Fresh and preserved (frozen), with consideration of the cellular response. <i>Neurosurgery</i> , 4(1), 18-29.	Skull is metabolically intensely active after reimplantation and is the ideal material from cranioplasty.	IIIB	Nonexperimental	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Reconstruction with cryopreserved autologous bone flap	N/A	12	Repair of membranous skull
Schultke, E., Hampl, J. A., Jatzwauk, L., Krex, D., & Schackert, G. (1999). An easy and safe method to store and disinfect explanted skull bone. <i>Acta Neurochirurgica</i> , 141(5), 525-528.	Refrigeration plus steam disinfection of autologous skull bone prior to re-implantation seems to offer reliable safety for its use for defect closure.	IIB	Quasi-experimental	Explanted cranial bone flaps	Treatment with three different disinfection methods	No treatment	20	Bone graft infection
Shoakazemi, A., Flannery, T., & McConnell, R. S. (2009). Long-term outcome of subcutaneously preserved autologous cranioplasty. <i>Neurosurgery</i> , 65(3), 505-510.	Storage of a cranioplasty flap in a subcutaneous pouch in the abdominal wall has a favorable long-term outcome.	IIIB	Nonexperimental	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Subcutaneous storage of bone flap in the patient's abdominal wall	N/A	100	Cosmetic appearance, infection rate, hematoma
Sultan, S. M., Davidson, E. H., Butala, P., Schachar, J. S., Witek, L., Szpalski, C., et al. (2011). Interval cranioplasty: Comparison of current standards. <i>Plastic and Reconstructive Surgery</i> , 127(5), 1855-1864.	Current preservation methods for interval cranioplasty do not maintain bone graft viability. Subcutaneous storage appears to provide a small advantage compared with freezing.	IIB	Quasi-experimental	Sprague-Dawley rats	Replantation after subcutaneous storage in the abdominal wall	Replantation after frozen storage	45	Bone graft viability

Recommendation II

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Tahir, M. Z., Shamim, M. S., Sobani, Z. A., Zafar, S. N., Qadeer, M., & Bari, M. E. (2013). Safety of untreated autologous cranioplasty after extracorporeal storage at - 26 degree celsius. <i>British Journal of Neurosurgery</i> , 27(4), 479-482.	Extracorporeal storage of untreated autologous cranial bone flaps is safe with significantly low risk of infection at -26° C.	IIIB	Nonexperimental	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Replantation after cryopreservation	N/A	88	Postoperative infection
Vanaclocha, V., Saiz-Sapena, N., Garcia-Casasola, C., & De Alava, E. (1997). Cranioplasty with autogenous autoclaved calvarial bone flap in the cases of tumoural invasion. <i>Acta Neurochirurgica</i> , 139(10), 970-976.	Autoclaved bone, if replaced with direct contact with living bone, is gradually repopulated with osteocytes. Autoclaved bone flaps are a good alternative when the original bone flap is invaded but not destroyed by tumoral cells.	IIIC	Nonexperimental	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap due to tumoral invasion of the bone flap	Steam sterilization and replantation of the bone flap	N/A	62	Postoperative complications, repopulation of bone with osteocytes, and destruction of tumor cells
Wester, K. (1994). Cranioplasty with an autoclaved bone flap, with special reference to tumour infiltration of the flap. <i>Acta Neurochirurgica</i> , 131(3-4), 223-225.	All the prostheses and reimplanted flaps were accepted by the patients without complications such as infection or resorption, and with cosmetically satisfying results. The tumor infiltrated flaps remained tumor free.	VB	Case report	Patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Reconstruction with steam sterilized autologous bone flap	Reconstruction with polymethylmethacrylate	25	Postoperative infection, resorption, and destruction of tumor cells
Wimmer C, Krismer M, Gluch H, Ogon M, Stockl B. Autogenic versus allogenic bone grafts in anterior lumbar interbody fusion. <i>Clin Orthop Relat Res</i> . 1999;(360)(360):122-126.	The use of allogenic bone appears justified considering the possible complications associated with harvesting iliac crest bone.	IIIB	Nonexperimental	Patients undergoing combined anterior and posterior fusion	Autologous bone harvested from the iliac crest	Allograft bone	94	Postoperative incidence of pseudoarthrosis
Yazici M, Asher MA. Freeze-dried allograft for posterior spinal fusion in patients with neuromuscular spinal deformities. <i>Spine (Phila Pa 1976)</i> . 1997;22(13):1467-1471.	Freeze-dried allograft fusion is a reliable and effective method for posterior spinal fusion in patients with neur	VB	Case report	Patients with neuromuscular disorders requiring instrumentation and fusion	Allograft bone	N/A	40	Infection, pseudoarthrosis, and transmissible disease
Zingale, A., & Albanese, V. (2003). Cryopreservation of autogeneous bone flap in cranial surgical practice: What is the future? A grade B and evidence level 4 meta-analytic study. <i>Journal of Neurosurgical Sciences</i> , 47(3), 137-139.	Freezing the bone flap is preferable to abdominal pocketing because it needs no double surgical abdominal time and the bone flap frozen is stronger the mechanical loading than fresh flap.	IC	Systematic review	Papers related to patients undergoing decompressive craniectomy and subsequent reconstruction with autologous bone flap	Reconstruction with cryopreserved autologous bone flap	Reconstruction with subcutaneously stored bone flap	7	Frequency of bone resorption and infection

Recommendation III

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
21 CFR 1271: Human cells, tissues, and cellular and tissue-based products.(April 2012).		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Agarwal, A., Waghay, A., Gupta, S., Sharma, R., & Milas, M. (2013). Cryopreservation of parathyroid tissue: An illustrated technique using the cleveland clinic protocol. Journal of the American College of Surgeons, 216(1), e1-9.	Cryopreservation of human parathyroid tissue can occur with a simplified technique that offers durable cure to a minority of patients who would otherwise have limited improvement of permanent hypocalcemia.	VA	Clinician experience	Patients requiring parathyroid autotransplantation due to persistent hypothyroidism resulting from devascularization of the parathyroid glands during surgery	Cleveland Clinic protocol for cryopreservation and autotransplantation of the parathyroid	N/A	N/A	N/A
Alvarez-Hernandez, D., Gonzalez-Suarez, I., Carrillo-Lopez, N., Naves-Diaz, M., Anguita-Velasco, J., & Cannata-Andia, J. B. (2008). Viability and functionality of fresh and cryopreserved human hyperplastic parathyroid tissue tested in vitro. American Journal of Nephrology, 28(1), 76-82.	The results demonstrate differences in the response to calcium between fresh and cryopreserved glands and no differences in response to calcitriol. This in vitro culture method may be useful to discriminate between responsive and nonresponsive human parathyroid glands.	IIC	Quasi-experimental	Segments of parathyroid glands from patients with secondary hypoparathyroidism	Cultures	Fresh parathyroid tissue	18	Viability and functionality of cryopreserved parathyroid glands
Barreira CE. Cernea CR. Brandão LG. Custodio MR. Caldini ET. de Menezes Montenegro FL. (2011). Effects of time on ultrastructural integrity of parathyroid tissue before cryopreservation. World Journal of Surgery, 35(11), 2440-2444.	Analysis of the ultrastructure of hyperplastic parathyroid gland tissue showed that ultrastructural integrity was in most cases properly maintained in fragments stored up to 12 hours in a cell culture solution at 4° C.	IIC	Quasi-experimental	Patients undergoing total parathyroidectomy, autotransplantation, and cryopreservation of parathyroid segments	Fixation and histological examination of cryopreserved parathyroid segments during 5 different time periods	Immediate fixation and histological examination	11	Viability and structural integrity of cryopreserved parathyroid segments
Cohen, M. S., Dilley, W. G., Wells, S. A., Jr, Moley, J. F., Doherty, G. M., Sicard, G. A., et al. (2005). Long-term functionality of cryopreserved parathyroid autografts: A 13-year prospective analysis. Surgery, 138(6), 1033-1040.	The duration of cryopreservation was a significant indicator of graft failure, and no functional autograft was observed beyond 22 months of preservation. Cryopreserved heterotopic parathyroid autotransplantation is a useful treatment modality for patients with postoperative hypocalcemia after thyroid or parathyroid surgery, who do not respond to immediate parathyroid autotransplantation.	IIIB	Nonexperimental	Patients undergoing parathyroid autotransplantation after cryopreservation of parathyroid tissue	Review and analysis of prospective data	N/A	26	Functionality of autotransplanted parathyroid segments
de Menezes Montenegro, F. L., Custodio, M. R., Arap, S. S., Reis, L. M., Sonohara, S., Castro, I. V., et al. (2007). Successful implant of long-term cryopreserved parathyroid glands after total parathyroidectomy. Head & Neck, 29(3), 296-300.	These cases show that parathyroid tissue may remain viable even after long-term storage.	VB	Case report	Two women, 40- and 44-years, who underwent total parathyroidectomy with delayed parathyroid autotransplantation	Long-term storage (ie, 21- and 30-months) of cryopreserved parathyroid segments	N/A	N/A	Viability of cryopreserved parathyroid tissue based on length of time in storage

Recommendation III

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Guerrero, M. A. (2010). Cryopreservation of parathyroid glands. <i>International Journal of Endocrinology</i> , 2010, 829540.	Differentiating between transient and permanent hypocalcemia is critical. Cryopreservation facilitates appropriate surgical and clinical decisions, prevents unnecessary immediate parathyroid autotransplants, and offers a chance to cure aparathyroidism.	VA	Expert opinion	N/A	N/A	N/A	N/A	Review of the current role of cryopreservation and autotransplantation of parathyroid tissue
Guerrero, M. A., Evans, D. B., Lee, J. E., Bao, R., Bereket, A., Gantela, S., et al. (2008). Viability of cryopreserved parathyroid tissue: When is continued storage versus disposal indicated?. <i>World Journal of Surgery</i> , 32(5), 836-839.	Viability of cryopreserved parathyroid cells is associated with duration of storage. Parathyroids preserved for greater than 24 months are unlikely to be viable. It seems reasonable to limit parathyroid cryopreservation to 24 months when frozen at -80° C. Further studies are needed to optimize the process of cryopreservation to enhance cell viability.	IIIB	Nonexperimental	Parathyroid specimens from 149 patients cryopreserved at -112° F (-80° C)	Assess viability using a hemacytometer to count viable tissue at various time periods	Nonviable tissue	501	Viability of cryopreserved parathyroid tissue based on length of time in storage
Human cells, tissues, and cellular and tissue-based products; establishment registration and listing. <i>Federal Register</i> . 2001;66(13):5447-5469.		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Saxe, A. W., Spiegel, A. M., Marx, S. J., & Brennan, M. F. (1982). Deferred parathyroid autografts with cryopreserved tissue after reoperative parathyroid surgery. <i>Archives of Surgery (Chicago, Ill.: 1960)</i> , 117(5), 538-543.	The presence of parathyroid hormone gradient of 2:1 or greater correlated well with freedom from calcium supplementation.	IIIC	Nonexperimental	Patients with primary or secondary hyperparathyroidism not caused by carcinoma undergoing delayed autotransplantation of cryopreserved parathyroid tissue	Review and analysis of prospective data	N/A	100	Functionality of autotransplanted parathyroid segments
Schneider, R., Ramaswamy, A., Slater, E. P., Bartsch, D. K., & Schlosser, K. (2012). Cryopreservation of parathyroid tissue after parathyroid surgery for renal hyperparathyroidism: Does it really make sense?. <i>World Journal of Surgery</i> , 36(11), 2598-2604.	Metachronous autotransplantation following parathyroid surgery in patients with renal hyperparathyroidism effectively normalizes parathyroid hormone and calcium levels. The success rate is high if an adequate cryopreservation procedure is applied. However, it is rarely necessary, and therefore the cryopreservation of parathyroid tissue in all patients has to be questioned, at least from an economic point of view.	IIIB	Nonexperimental	Patients with hypoparathyroidism after parathyroid surgery for renal hyperparathyroidism	Review and analysis of prospective data	N/A	15	Successful resolution of postoperative hypoparathyroidism after delayed autotransplantation of cryopreserved parathyroid tissue

Recommendation III

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Stotler BA, Reich-Slotky R, Schwartz J, et al. Quality monitoring of microbial contamination of cryopreserved parathyroid tissue. Cell & Tissue Banking. 2011;12(2):111-116.	Quality monitoring using this protocol is a useful tool to identify tissues contaminated with bacteria.	VB	Organizational experience	Patients undergoing subtotal or total parathyroidectomy as a method to prevent severe, postoperative hypocalcemia	Quality monitoring protocol for sterility of cryopreserved parathyroid tissue	N/A	47	Identification of cryopreserved parathyroid tissues contaminated with bacteria

Recommendation IV

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
21 CFR 1271: Human cells, tissues, and cellular and tissue-based products.(April 2012).		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Cram, A. E., & Domayer, M. A. (1983). Short-term preservation of human autografts. The Journal of Trauma, 23(10), 872-873.	With proper storage techniques, viable autografts can be maintained for 22 days without resorting to freezing.	IIC	Nonexperimental	Patients requiring split thickness autografts	Changing storage medium of split thickness skin grafts twice weekly	Not changing storage medium of split thickness skin grafts stored in NaCl	32	Successful engraftment
DeBono, R., Rao, G. S., & Berry, R. B. (1998). The survival of human skin stored by refrigeration at 4 degrees C in McCoy's 5A medium: Does oxygenation of the medium improve storage time? Plastic and Reconstructive Surgery, 102(1), 78-83.	McCoy's 5A medium allows at least 4 weeks of viable human skin storage by refrigeration at 4° C. Oxygenating the medium does not seem to improve the viable storage time, and carbon dioxide supplementation is detrimental.	IIB	Quasi-experimental	Patient undergoing breast reduction	Human split thickness skin grafts stored at 39.2° F (4° C) in various mediums over a 4-week period	Split thickness skin grafts stored in NaCl	1	Preservation of viability of stored skin
Human cells, tissues, and cellular and tissue-based products; establishment registration and listing. Federal Register. 2001;66(13):5447-5469.		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Mardini, S., Agullo, F. J., Salgado, C. J., Rose, V., Moran, S. L., & Chen, H. C. (2009). Delayed skin grafting utilizing autologous banked tissue. Annals of Plastic Surgery, 63(3), 311-313.	Delayed skin grafting with autologous banking allows direct observation during the early postoperative period, restricts the number of operations, and bypasses the cost of skin banking. This technique has proved to be a reliable and cost-effective method of skin storage.	VB	Case report	Patients having autologous skin harvested from the thigh and banked at the donor site	Bedside transfer of skin graft from donor to recipient site at the bedside	N/A	10	Successful healing of graft and donor site
Robb EC, Bechmann NRV, Plessinger RT, Boyce ST, Warden GD, Kagan RJ. Storage media and temperature maintain normal anatomy of cadaveric human skin for transplantation to full-thickness skin wounds. J Burn Care Rehabil. 2001;22(6):393-396.	The results support the hypothesis that increased availability of nutrients and increased storage temperature maintain higher viability of cadaveric human skin for transplantation to full-thickness cutaneous wounds.	IIB	Quasi-experimental	Cadaveric donor from the Ohio Valley Tissue and Skin Center	Samples stored in various mediums, temperatures, with and without changes of medium	Postive control: No storage/Negative control: Storage of sample in water	149	Successful engraftment
Sheridan, R., Mahe, J., & Walters, P. (1998). Autologous skin banking. Burns : Journal of the International Society for Burn Injuries, 24(1), 46-48.	The use of preserved autologous skin may be used after storage.	IIC	Nonexperimental	Patients where frozen autologous skin was autotransplanted to open wounds	N/A	N/A	42	Successful engraftment
Sterne, G. D., Titley, O. G., & Christie, J. L. (2000). A qualitative histological assessment of various storage conditions on short term preservation of human split skin grafts. British Journal of Plastic Surgery, 53(4), 331-336.	The viability of stored skin is improved if it is stored at a uniform 4° C as rolled sheets.	IIC	Quasi-experimental	Patients undergoing abdominoplasty	Human split thickness skin grafts stored at 39.2° F (4° C) in various configurations over a 4-week period	Fixed split thickness skin grafts	6	Preservation of viability of stored skin

Recommendation IV

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Titley, O. G., Cooper, M., Thomas, A., & Hancock, K. (1994). Stored skin--stored trouble? British Journal of Plastic Surgery, 47(1), 24-29.	Organisms colonizing grafts were primarily Staphylococcus aureus and coagulase-negative Staphylococci. Graft take was shown to decrease as organisms per gram increased.	IIIB	Nonexperimental	Consecutive patients undergoing split thickness skin grafting	Culture samples of refrigerated skin grafts stored for 3 weeks	Culture samples of skin grafts during harvesting	103	Successful engraftment

Recommendation V

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
21 CFR 1271: Human cells, tissues, and cellular and tissue-based products.(April 2012).		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Baumann FG, Catinella FP, Cunningham JN,Jr, Spencer FC. Vein contraction and smooth muscle cell extensions as causes of endothelial damage during graft preparation. Ann Surg. 1981;194(2):199-211.	The results suggest that pretreatment with papaverine greatly reduced endothelial cell loss.	IIB	Quasi-experimental	Dogs	Storage of cephalic vein segments in various cold solutions for two time periods	Fixed vein segments	10	Prevention of endothelial damage
Ebner, A., Poitz, D. M., Augstein, A., Strasser, R. H., & Deussen, A. (2012). Functional, morphologic, and molecular characterization of cold storage injury. Journal of Vascular Surgery, 56(1), 189-98.e3. doi:10.1016/j.jvs.2011.12.012; 10.1016/j.jvs.2011.12.012	Long-term cold storage impairs vascular function, and pathways that are involved in calcium signaling and vascular function. Various genes are significantly altered even after 2 hours, significantly before functional impairment was observed.	IIB	Quasi-experimental	Mice	Storage of proximal and distal sections of mouse aorta in cold solution for various time periods	Fixed vessel segments	6	Prevention of cold storage injury of blood vessels
Human cells, tissues, and cellular and tissue-based products; establishment registration and listing. Federal Register. 2001;66(13):5447-5469.		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Molnar, G. F., Nemes, A., Kekesi, V., Monos, E., & Nadasy, G. L. (2010). Maintained geometry, elasticity and contractility of human saphenous vein segments stored in a complex tissue culture medium. European Journal of Vascular & Endovascular Surgery, 40(1), 88-93.	Storage in tissue culture medium helps preserve the passive and active biomechanical properties of human saphenous vein segments. Such properties can be expected to improve graft tissue viability.	IB	Randomized controlled trial	Patients scheduled for coronary bypass operations	Storage of vein segments in various solutions and under varying conditions for various time periods	Fresh vein segments	72	Preservation of tensile strength, distensibility, elastic modulus and active strain
Wilbring, M., Tugtekin, S. M., Zatschler, B., Ebner, A., Reichenspurner, H., Kappert, U., et al. (2013). Preservation of endothelial vascular function of saphenous vein grafts after long-time storage with a recently developed potassium-chloride and N-acetylhistidine enriched storage solution. Thoracic & Cardiovascular Surgeon, 61(8), 656-662.	TiProtec is a feasible option for longer term storage of saphenous vein grafts in CABG vessel and transplant surgery.	IIIB	Nonexperimental	Patients undergoing elective first time coronary bypass grafting with saphenous veins between October 2008 and March 2010	Storage of vein segment in TiProtec	Storage of vein segment in NaCl	19	Preservation of maximum vessel wall tension

Recommendation VI

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
American association of tissue banks. sample procedure: Handling autologous bone skull flaps. version 14 . . August 2012.	This sample procedure is based on the AATB current Standards for Tissue Banking and practices used at AATB-accredited tissue banks. They are only examples and should be viewed only as recommendations. The practices and recommendations included in this document do not represent the sole approach; alternative approaches may be used. This document is offered as a guideline for use when developing procedures.	IVC	Clinical practice guideline	Any and all forms of tissue banking: retrieval, storage and distribution of human tissues for medical use	N/A	N/A	N/A	N/A
Bhandari M, Adili A, Lachowski RJ. High pressure pulsatile lavage of contaminated human tibiae: An in vitro study. J Orthop Trauma. 1998;12(7):479-484.	High pressure pulsatile lavage resulted in bacterial seeding into the intramedullary canal and significant damage to the architecture of the bone.	IIB	Quasi-experimental	Human tibiae from above knee amputations contaminated with two bacterial strains	Treatment with high-pressure pulsatile lavage	No treatment	9	Microbial detection and identification and evaluation of bone structure
Bhandari M, Schemitsch EH, Adili A, Lachowski RJ, Shaughnessy SG. High and low pressure pulsatile lavage of contaminated tibial fractures: An in vitro study of bacterial adherence and bone damage. J Orthop Trauma. 1999;13(8):526-533.	Low pressure pulsatile lavage led to less structural damage and was equally effective in removing bacterial within 3 hours debridement delay. The efficacy of low pressure lavage at 6 hours debridement delay is questionable.	IIB	Quasi-experimental	Sections from human tibiae contaminated with <i>Staphylococcus aureus</i>	Treatment with low- and high-pressure pulsatile lavage	No treatment	10	Microbial detection and identification and evaluation of bone structure
Bhandari, M., Adili, A., & Schemitsch, E. H. (2001). The efficacy of low-pressure lavage with different irrigating solutions to remove adherent bacteria from bone. The Journal of Bone and Joint Surgery-American Volume, 83-A(3), 412-419.	Findings suggest that certain solutions may be more effective in removing bacteria from bone than mechanical irrigation with saline alone. Low pressure lavage with the soap solution resulted in the greatest removal of adherent bacteria from bone.	IIB	Quasi-experimental	Calvarial cells from newborn mice	Exposure to equivalent concentrations of five different irrigation solutions after three different time periods	Exposure to NaCl	6	Function of osteoblasts and osteoclasts in vitro and amount of adherent bacteria removed from bone
Bruce, B., Sheibani-Rad, S., Appleyard, D., Calfee, R. P., Reinert, S. E., Chapin, K. C., et al. (2011). Are dropped osteoarticular bone fragments safely reimplantable in vivo?. Journal of Bone & Joint Surgery - American Volume, 93(5), 430-438.	The majority of osteochondral fragments that contact the operating room floor produce positive bacterial cultures. Five minutes of cleansing with 10% povidone iodine solution followed by a normal saline rinse appears to provide the optimal balance between effective decontamination and cellular toxicity for dropped autologous bone in the operative setting.	IIB	Quasi-experimental	Osteoarticular fragments dropped onto the OR floor	Aerobic and anaerobic culture plates	Swabs of OR floor	162	Microbial detection and identification
Centeno RF, Desai AR, Watson ME. Management of contaminated autologous grafts in plastic surgery. Eplasty. 2008;8:e23.	Although autologous grafts do become contaminated in plastic surgery, the overwhelming majority can be safely decontaminated and replanted with minimal clinical sequelae.	IIIB	Nonexperimental	American Society of Aesthetic Plastic Surgery members	Survey	N/A	223	Protocols for management of contaminated autologous grafts

Recommendation VI

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Hirn M, Laitinen M, Pirkkalainen S, Vuento R. Cefuroxime, rifampicin and pulse lavage in decontamination of allograft bone. <i>J Hosp Infect.</i> 2004;56(3):198-201.	Low-pressure pulse lavage with sterile saline solution is very effective in removing bacteria from the bone graft, when compared with antibiotic solutions.	IIB	Quasi-experimental	Femoral heads harvested from healthy donors during primary total hip arthroplasty procedures rubbed on the OR floor for 60 minutes	Treatment by soaking in antibiotic solution or low-pressure pulsatile lavage with NaCl	Soaking in NaCl irrigation	30	Microbial detection and identification
Jankowitz, B. T., & Kondziolka, D. S. (2006). When the bone flap hits the floor. <i>Neurosurgery</i> , 59(3), 585-589.	Replacement after disinfection is an appropriate option for contaminated bone flaps that avoids the expense and time of cranioplasty.	IIIB	Nonexperimental	Instances of dropped bone flaps	Retrospective review and analysis	N/A	14	SSI
Kang, L., Mermel, L. A., & Trafton, P. G. (2008). What happens when autogenous bone drops out of the sterile field during orthopaedic trauma surgery. <i>Journal of Orthopaedic Trauma</i> , 22(6), 430-431.	Approximately 1 in 3 orthopaedic trauma surgeons have experienced at least 1 incidence when autogenous bone was dropped out of the sterile field during surgery. Decontamination of the bone was done by a variety of methods. None of the respondents reported that dropping bone out of the sterile field definitively resulted in a surgical site infection.	IIIB	Nonexperimental	Orthopedic trauma surgeons	Survey	N/A	104	Practices for dropped autologous bone
Kaysinger KK, Nicholson NC, Ramp WK, Kellam JF. Toxic effects of wound irrigation solutions on cultured tibiae and osteoblasts. <i>J Orthop Trauma.</i> 1995;9:303-311.	A wound irrigation solution containing bacitracin may be safer than one containing an antiseptic, although other antibiotic agents should be tested regarding their effects on osteoblast function. Three common antiseptic solutions: hydrogen peroxide, povidone-iodine solution, and povidone-iodine scrub, were shown to cause frank toxicity in bone at concentrations used clinically.	IIB	Quasi-experimental	Osteoblasts isolated from 17-day chick embryo calvariae/Tibiae harvested from 18-day chick embryos	Exposure to three antiseptic and one antibiotic solutions at various concentrations for two minutes	Exposure to NaCl	6 per group	Cytotoxicity to bones and cells
Khan M, Rothrauff BB, Merali F, Musahl V, Peterson D, Ayeni OR. Management of the contaminated anterior cruciate ligament graft. <i>Arthroscopy.</i> 2014;30(2):236-244.	The optimal agent for decontamination is CHG; however, the results should be taken with caution. +F2:F312	IA	Systematic review	Experimental studies	Management of contaminated anterior cruciate ligament grafts	N/A	6	Protocols for decontamination
Lacey RW. Antibacterial activity of povidone iodine towards non-spore-forming bacteria. <i>J Appl Bacteriol.</i> 1979;46(3):443-449.	Hemoglobin inactivates povidone iodine.	IIB	Quasi-experimental	Cultures of bacterial strains spread over 3 centimeter circles on the forearms of healthy volunteers	Treatment with povidone iodine	No treatment	4	Microbial detection and identification
Makary MA, Holzmüller CG, Sexton JB, et al. Operating room debriefings. <i>Jt Comm J Qual Patient Saf.</i> 2006;32(7):407-10, 357.	Debriefing is a proactive approach to learn from defects, a strategy that may prevent the occurrence of sentinel events.	VB	Organizational experience	Perioperative team members	Use of a postoperative debriefing tool	N/A	N/A	N/A

Recommendation VI

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Mangram AJ, Horan TC, Pearson ML, Silver LC, Jar-vis WR; Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee. Guideline for prevention of surgical site infection, 1999. Am J Infect Control. 1999;27(2):97-132.	Part I, "Surgical Site Infection: An Overview," describes the epidemiology, definitions, microbiology, pathogenesis, and surveillance of SSIs. Included is a detailed discussion of the pre-, intra-, and postoperative issues relevant to SSI genesis. Part II, "Recommendations for Prevention of Surgical Site Infection," represents the consensus of the Hospital Infection Control Practices Advisory Committee (HICPAC) regarding strategies for the prevention of SSIs.	IVA	Clinical practice guideline	Health care personnel	N/A	N/A	N/A	N/A
Matsuno, A., Tanaka, H., Iwamuro, H., Takanashi, S., Miyawaki, S., Nakashima, M., et al. (2006). Analyses of the factors influencing bone graft infection after delayed cranioplasty. Acta Neurochirurgica, 148(5), 535-40; discussion 540.	Autoclaved and autogenous bone grafts and polymethylmethacrylate have a significantly higher rate of graft infection. Titanium mesh has the significantly lowest rate of graft infection.	IIIB	Nonexperimental	Patients undergoing delayed cranioplasty using autologous cranial bone subjected to ethylene oxide sterilization	Retrospective review and analysis	N/A	54	Bone graft infection
Presnal, B. P., & Kimbrough, E. E. (1993). What to do about a dropped bone graft. Clinical Orthopaedics and Related Research, (296)(296), 310-311.	Extensive sterilization of a dropped graft is not essential.	IB	Randomized controlled trial	Surplus bone specimens from orthopedic and neurosurgical procedures	Dropped on the OR floor	Not dropped on OR floor	100	Microbial detection and identification
Schultke, E., Hampf, J. A., Jatzwauk, L., Krex, D., & Schackert, G. (1999). An easy and safe method to store and disinfect explanted skull bone. Acta Neurochirurgica, 141(5), 525-528.	Refrigeration plus steam disinfection of autologous skull bone prior to re-implantation seems to offer reliable safety for its use for defect closure.	IIB	Quasi-experimental	Explanted cranial bone flaps	Treatment with three different disinfection methods	No treatment	20	Bone graft infection
Soyer, J., Rouil, M., & Castel, O. (2002). The effect of 10% povidone-iodine solution on contaminated bone allografts. The Journal of Hospital Infection, 50(3), 183-187.	The bacteriocidal activity of 10% povidone-iodine solution depends on the level of contamination and the duration of exposures\.	IB	Randomized controlled trial	Samples obtained from a single femoral head	Treatment with two different levels of bacterial contamination and at four different time periods to 10% povidone iodine	No treatment	100	Microbial detection and identification
Yaman F, Unlu G, Atilgan S, Celik Y, Ozekinci T, Yaldiz M. Microbiologic and histologic assessment of intentional bacterial contamination of bone grafts. J Oral Maxillofac Surg. 2007;65(8):1490-1494.	Rifamycin seems to be the most suitable agent for elimination of contamination introduced into bone grafts during surgery.	IIB	Quasi-experimental	Rat femora contaminated with three bacteria	Immersion in various decontamination solutions for specified periods of time	No treatment	160	Microbial detection and identification and evaluation of bone structure

Recommendation VII

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Greenberg CC, Regenbogen SE, Studdert DM, et al. Patterns of communication breakdowns resulting in injury to surgical patients. J Am Coll Surg. 2007;204(4):533-540.	Interventions to prevent these breakdowns should involve defined triggers, structured transfer of care, and the standard use of read backs.	IIIB	Nonexperimental	Malpractice claims	Review and analysis of claims data	N/A	60	Communication failure
Lagios MD. Pathology procedures for evaluation of the specimen with potential or documented ductal carcinoma in situ. Semin Breast Dis. 2000;3:42-49.	Only by using a sequential method of examination can the likely size and margins be evaluated correctly. Stereotactic core biopsy increases the need for correlation and special handling.	VB	Clinician experience	Pathologists	N/A	N/A	N/A	
Recommended practices for specimen management. In: Perioperative standards and recommended practices. Denver, CO: AORN; 2014.	Specimen management is a multidisciplinary process that includes needs assessment, site identification, collection and handling, transfer from the sterile field, containment, specimen identification and labeling, preservation, transport, disposition of the specimen, and documentation.	IVA	Clinical practice guideline	Perioperative RNs	N/A	N/A	N/A	N/A
Siegel JD, Rhinehart E, Jackson M, Chiarello L, Health Care Infection Control Practices Advisory Committee. 2007 guideline for isolation precautions: Preventing transmission of infectious agents in health care settings. Am J Infect Control. 2007;35(10 Suppl 2):S65-164.	This document is intended for use by infection control staff, healthcare epidemiologists, healthcare administrators, nurses, other healthcare providers, and persons responsible for developing, implementing, and evaluating infection control programs for healthcare settings across the continuum of care.	IVA	Clinical practice guideline	Health care personnel	N/A	N/A	N/A	N/A
Wolff AC, Hammond ME, Hicks DG, et al. Recommendations for human epidermal growth factor receptor 2 testing in breast cancer: American society of clinical Oncology/College of american pathologists clinical practice guideline update. Arch Pathol Lab Med. 2014;138(2):241-256.	The panel recommends that HER2 status should be determined for all invasive breast cancer. Elements to reliably reduce assay variation (eg, specimen handling) are specified. The panel strongly recommends the use of standardized operating procedures for tissue handling.	IVB	Clinical practice guideline	Oncologists/Pathologists	N/A	N/A	N/A	N/A

Recommendation VIII

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
21 CFR 1271: Human cells, tissues, and cellular and tissue-based products.(April 2012).		Reg	N/A	N/A	N/A	N/A	N/A	N/A
29 CFR 1910.1030: Hazardous substances. bloodborne pathogens. .		Reg	N/A	N/A	N/A	N/A	N/A	N/A
American Association of Tissue Banks. (2012). Standards for tissue banking. McLean, Va.: American Association of Tissue Banks.	The sharing of experiences and best practices, education, and a quality culture has led to maintaining a template that is referenced by tissue banks, health care facilities, standards-setting associations and regulators worldwide.	IVC	Clinical practice guideline	Perioperative RNs	N/A	N/A	N/A	N/A
American association of tissue banks. sample procedure: Handling autologous bone skull flaps. version 14 . . August 2012.	This sample procedure is based on the AATB current Standards for Tissue Banking and practices used at AATB-accredited tissue banks. They are only examples and should be viewed only as recommendations. The practices and recommendations included in this document do not represent the sole approach; alternative approaches may be used. This document is offered as a guideline for use when developing procedures.	IVC	Clinical practice guideline	Any and all forms of tissue banking: retrieval, storage and distribution of human tissues for medical use	N/A	N/A	N/A	N/A
Benner, J. (2009). Establish a transparent chain-of-custody to mitigate risk and ensure quality of specialized samples. Biopreservation and Biobanking, 7(3), 151-153.	This article addressed maintaining 21 CF Part 11 compliance, installing validated, redundant equipment for specimen storage and transportation, employing temperature-monitoring and -tracking devices, and best practices for implementing inventory and data management systems as well as audit trails.	VB	Clinician experience	Personnel in need of direction for maintaining 21 CFR Part 11 compliance and establishing best practices for tissue	N/A	N/A	N/A	N/A
Food and Drug Administration. (2012). Current good tissue practice (CGTP) and additional requirements for manufacturers of human cells, tissues, and cellular and tissue-based products (HCT/Ps)		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Greenberg CC, Regenbogen SE, Studdert DM, et al. Patterns of communication breakdowns resulting in injury to surgical patients. J Am Coll Surg. 2007;204(4):533-540.	Interventions to prevent these breakdowns should involve defined triggers, structured transfer of care, and the standard use of read backs.	IIIB	Nonexperimental	Malpractice claims	Review and analysis of claims data	N/A	60	Communication failure

Recommendation VIII

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Hirn M, Laitinen M, Pirkkalainen S, Vuento R. Cefuroxime, rifampicin and pulse lavage in decontamination of allograft bone. <i>J Hosp Infect.</i> 2004;56(3):198-201.	Low-pressure pulse lavage with sterile saline solution is very effective in removing bacteria from the bone graft, when compared with antibiotic solutions.	IIB	Quasi-experimental	Femoral heads harvested from healthy donors during primary total hip arthroplasty procedures rubbed on the OR floor for 60 minutes	Treatment by soaking in antibiotic solution or low-pressure pulsatile lavage with NaCl	Soaking in NaCl irrigation	30	Microbial detection and identification
Makary MA, Holzmueller CG, Sexton JB, et al. Operating room debriefings. <i>Jt Comm J Qual Patient Saf.</i> 2006;32(7):407-10, 357.	Debriefing is a proactive approach to learn from defects, a strategy that may prevent the occurrence of sentinel events.	VB	Organizational experience	Perioperative team members	Use of a postoperative debriefing tool	N/A	N/A	N/A
Recommended practices for specimen management. In: <i>Perioperative standards and recommended practices.</i> Denver, CO: AORN; 2014.	Specimen management is a multidisciplinary process that includes needs assessment, site identification, collection and handling, transfer from the sterile field, containment, specimen identification and labeling, preservation, transport, disposition of the specimen, and documentation.	IVA	Clinical practice guideline	Perioperative RNs	N/A	N/A	N/A	N/A
Valenstein PN, Sirota RL. Identification errors in pathology and laboratory medicine. <i>Clin Lab Med.</i> 2004;24(4):979-96, vii. doi: S0272-2712(04)00070-8 [pii].	Identification errors are defined, error detection methods, frequency of errors, measures used to prevent identification errors, and areas for further study are discussed.	VB	Literature review	Personnel interested in addressing the issue of mislabeled specimens	N/A	N/A	N/A	N/A
When a rose is not a rose: The problem of mislabeled specimens. <i>Laboratory Medical DirecTIPs.</i> 2009.	Any improvement in patient safety involves three steps: discovering the problem, finding a remedy, and teaching those involved.	VB	Expert opinion	Personnel interested in addressing the issue of mislabeled specimens	N/A	N/A	N/A	N/A

Recommendation IX

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
21 CFR 1271: Human cells, tissues, and cellular and tissue-based products.(April 2012).		Reg	N/A	N/A	N/A	N/A	N/A	N/A
29 CFR 1910.1030: Hazardous substances. bloodborne pathogens. .		Reg	N/A	N/A	N/A	N/A	N/A	N/A
45 CFR parts 160 and 164. modifications to the HIPAA privacy, security, enforcement, and breach notification rules under the health information technology for economic and clinical health act and the genetic information nondiscrimination act; other modifications to the HIPAA rules; final rule. Federal Register. 2013;78(17):5566-5702.		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Food and Drug Administration. (2012). Current good tissue practice (CGTP) and additional requirements for manufacturers of human cells, tissues, and cellular and tissue-based products (HCT/Ps)		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Recommended practices for perioperative health care information management. In: Perioperative standards and recommended practices. Denver, Colo.: AORN; 2013:387-408.	Documentation includes related information about the patient's current and past health status, nursing diagnoses and interventions, expected patient outcomes, and evaluation of the patient's response to perioperative nursing care.	IVB	Clinical practice guideline	Perioperative RNs	N/A	N/A	N/A	N/A
Standards of perioperative nursing practice. In: Perioperative standards and recommended practices. Denver, CO: AORN; 2014:3-42.	It is the perioperative RN's responsibility to meet these standards, assuming that adequate environmental working conditions and necessary resources are available to support and facilitate the nurse's attainment of these standards.	IVB	Clinical practice guideline	Perioperative RNs	N/A	N/A	N/A	N/A

Recommendation X

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
21 CFR 1271: Human cells, tissues, and cellular and tissue-based products.(April 2012).		Reg	N/A	N/A	N/A	N/A	N/A	N/A
29 CFR 1910.1030: Hazardous substances. bloodborne pathogens. .		Reg	N/A	N/A	N/A	N/A	N/A	N/A
American Association of Tissue Banks. (2012). Standards for tissue banking. McLean, Va.: American Association of Tissue Banks.	The sharing of experiences and best practices, education, and a quality culture has led to maintaining a template that is referenced by tissue banks, health care facilities, standards-setting associations and regulators worldwide.	IVC	Clinical practice guideline	Perioperative RNs	N/A	N/A	N/A	N/A
American association of tissue banks. sample procedure: Handling autologous bone skull flaps. version 14 . . August 2012. .	This sample procedure is based on the AATB current Standards for Tissue Banking and practices used at AATB-accredited tissue banks. They are only examples and should be viewed only as recommendations. The practices and recommendations included in this document do not represent the sole approach; alternative approaches may be used. This document is offered as a guideline for use when developing procedures.	IVC	Clinical practice guideline	Any and all forms of tissue banking: retrieval, storage and distribution of human tissues for medical use	N/A	N/A	N/A	N/A
Benner, J. (2009). Establish a transparent chain-of-custody to mitigate risk and ensure quality of specialized samples. Biopreservation and Biobanking, 7(3), 151-153.	This article addressed maintaining 21 CF Part 11 compliance, installing validated, redundant equipment for specimen storage and transportation, employing temperature-monitoring and -tracking devices, and best practices for implementing inventory and data management systems as well as audit trails.	VB	Clinician experience	Personnel in need of direction for maintaining 21 CFR Part 11 compliance and establishing best practices for tissue	N/A	N/A	N/A	N/A
Cram, A. E., & Domayer, M. A. (1983). Short-term preservation of human autografts. The Journal of Trauma, 23(10), 872-873.	With proper storage techniques, viable autografts can be maintained for 22 days without resorting to freezing.	IIIC	Nonexperimental	Patients requiring split thickness autografts	Changing storage medium of split thickness skin grafts twice weekly	Not changing storage medium of split thickness skin grafts stored in NaCl	32	Successful engraftment
Food and Drug Administration. (2012). Current good tissue practice (CGTP) and additional requirements for manufacturers of human cells, tissues, and cellular and tissue-based products (HCT/Ps)		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Joint Commission. Transplant safety. In: Comprehensive accreditation manual for ambulatory care E-dition. March 2014 ed.		Acc	N/A	N/A	N/A	N/A	N/A	N/A

Recommendation X

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Joint Commission. Transplant safety. In: Comprehensive accreditation manual for hospitals E-dition. March 2014 ed.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
Robb EC, Bechmann NRV, Plessinger RT, Boyce ST, Warden GD, Kagan RJ. Storage media and temperature maintain normal anatomy of cadaveric human skin for transplantation to full-thickness skin wounds. J Burn Care Rehabil. 2001;22(6):393-396.	The results support the hypothesis that increased availability of nutrients and increased storage temperature maintain higher viability of cadaveric human skin for transplantation to full-thickness cutaneous wounds.	IIB	Quasi-experimental	Cadaveric donor from the Ohio Valley Tissue and Skin Center	Samples stored in various mediums, temperatures, with and without changes of medium	Postive control: No storage/Negative control: Storage of sample in water	149	Successful engraftment
Titely, O. G., Cooper, M., Thomas, A., & Hancock, K. (1994). Stored skin--stored trouble? British Journal of Plastic Surgery, 47(1), 24-29.	Organisms colonizing grafts were primarily Staphylococcus aureus and coagulase-negative Staphylococci. Graft take was shown to decrease as organisms per gram increased.	IIIB	Nonexperimental	Consecutive patients undergoing split thickness skin grafting	Culture samples of refrigerated skin grafts stored for 3 weeks	Culture samples of skin grafts during harvesting	103	Successful engraftment

Recommendation XI

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
21 CFR 1271: Human cells, tissues, and cellular and tissue-based products.(April 2012).		Reg	N/A	N/A	N/A	N/A	N/A	N/A
29 CFR 1910.1030: Hazardous substances. bloodborne pathogens. .		Reg	N/A	N/A	N/A	N/A	N/A	N/A
American Association of Tissue Banks. (2012). Standards for tissue banking. McLean, Va.: American Association of Tissue Banks.	The sharing of experiences and best practices, education, and a quality culture has led to maintaining a template that is referenced by tissue banks, health care facilities, standards-setting associations and regulators worldwide.	IVC	Clinical practice guideline	Perioperative RNs	N/A	N/A	N/A	N/A
American association of tissue banks. sample procedure: Handling autologous bone skull flaps. version 14 . . August 2012.	This sample procedure is based on the AATB current Standards for Tissue Banking and practices used at AATB-accredited tissue banks. They are only examples and should be viewed only as recommendations. The practices and recommendations included in this document do not represent the sole approach; alternative approaches may be used. This document is offered as a guideline for use when developing procedures.	IVC	Clinical practice guideline	Any and all forms of tissue banking: retrieval, storage and distribution of human tissues for medical use	N/A	N/A	N/A	N/A
Chiang HY, Steelman VM, Pottinger JM, et al. Clinical significance of positive cranial bone flap cultures and associated risk of surgical site infection after craniotomies or craniectomies. J Neurosurg. 2011;114(6):1746-1754.	Operative factors, such as the way the skin is prepared before the incision, rather than the skin flora contaminants on bone flaps may play an important role in the pathogenesis of infection after craniectomy.	IIIA	Nonexperimental	Patients undergoing replantation of cranial bone flaps	Replanting cranial bone flap with positive result	N/A	372	Infection
Food and Drug Administration. (2012). Current good tissue practice (CGTP) and additional requirements for manufacturers of human cells, tissues, and cellular and tissue-based products (HCT/Ps)		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Human cells, tissues, and cellular and tissue-based products; establishment registration and listing. Federal Register. 2001;66(13):5447-5469.		Reg	N/A	N/A	N/A	N/A	N/A	N/A

Recommendation XI

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Makary MA, Holzmueller CG, Thompson D, et al. Operating room briefings: Working on the same page. Jt Comm J Qual Patient Saf. 2006;32(6):351-355.	A team of quality and safety researchers at The Johns Hopkins Medical Institutions created the OR Briefing tool to provide a structured approach to promote effective interdisciplinary communication and teamwork in the OR.	VB	Organizational experience	Perioperative team members	Use of a preoperative briefing tool	N/A	N/A	N/A
Recommended practices for perioperative health care information management. In: Perioperative standards and recommended practices. Denver, Colo.: AORN; 2013:387-408.	Documentation includes related information about the patient's current and past health status, nursing diagnoses and interventions, expected patient outcomes, and evaluation of the patient's response to perioperative nursing care.	IVB	Clinical practice guideline	Perioperative RNs	N/A	N/A	N/A	N/A
Valenstein PN, Sirota RL. Identification errors in pathology and laboratory medicine. Clin Lab Med. 2004;24(4):979-96, vii. doi: S0272-2712(04)00070-8 [pii].	Identification errors are defined, error detection methods, frequency of errors, measures used to prevent identification errors, and areas for further study are discussed.	VB	Literature review	Personnel interested in addressing the issue of mislabeled specimens	N/A	N/A	N/A	N/A
When a rose is not a rose: The problem of mislabeled specimens. Laboratory Medical DirecTIPs. 2009.	Any improvement in patient safety involves three steps: discovering the problem, finding a remedy, and teaching those involved.	VB	Expert opinion	Personnel interested in addressing the issue of mislabeled specimens	N/A	N/A	N/A	N/A

Recommendation XII

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
21 CFR 1271: Human cells, tissues, and cellular and tissue-based products.(April 2012).		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Accreditation Association for Ambulatory Health Care.,. Surgical and related services. In: Accreditation handbook for ambulatory health care. Skokie, Ill.: Accreditation Association for Ambulatory Health Care; 2014:52-55.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
American Association of Tissue Banks. (2012). Standards for tissue banking. McLean, Va.: American Association of Tissue Banks.	The sharing of experiences and best practices, education, and a quality culture has led to maintaining a template that is referenced by tissue banks, health care facilities, standards-setting associations and regulators worldwide.	IVC	Clinical practice guideline	Any and all forms of tissue banking: retrieval, storage and distribution of human tissues for medical use	N/A	N/A	N/A	N/A
American association of tissue banks. sample procedure: Handling autologous bone skull flaps. version 14 . . August 2012.	This sample procedure is based on the AATB current Standards for Tissue Banking and practices used at AATB-accredited tissue banks. They are only examples and should be viewed only as recommendations. The practices and recommendations included in this document do not represent the sole approach; alternative approaches may be used. This document is offered as a guideline for use when developing procedures.	IVC	Clinical practice guideline	Any and all forms of tissue banking: retrieval, storage and distribution of human tissues for medical use	N/A	N/A	N/A	N/A
Centers for Medicare & Medicaid Services. State operations manual appendix A—Survey protocol, regulations and interpretive guidelines for hospitals. . Rev. 105; 3/21/14.		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Centers for Medicare & Medicaid Services. State operations manual appendix L: Guidance for surveyors: Ambulatory surgical centers. . Rev. 99; 1/31/14.		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Food and Drug Administration. (2012). Current good tissue practice (CGTP) and additional requirements for manufacturers of human cells, tissues, and cellular and tissue-based products (HCT/Ps)		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Governance. In: 2014 accreditation handbook for ambulatory health care. Skokie, IL: Accreditation Association for Ambulatory Health Care; 2014:19-26.		Acc	N/A	N/A	N/A	N/A	N/A	N/A

Recommendation XII

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Joint Commission. Transplant safety. In: Comprehensive accreditation manual for ambulatory care E-dition. March 2014 ed.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
Joint Commission. Transplant safety. In: Comprehensive accreditation manual for hospitals E-dition. March 2014 ed.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
LD.04.01.07: The hospital has policies and procedures that guide and support patient care, treatment, and services. In: Hospital accreditation standards 2014. 2014th ed. Oakbrook Terrace, IL: Joint Commission Resources; 2014.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
LD.04.01.07: The organization has policies and procedures that guide and support patient care, treatment, or services. In: Standards for ambulatory care 2014 : Standards, elements of performance, scoring, accreditation polices. Oakbrook Terrace, IL: Joint Commission Resources; 2014.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
SS.1: Organization. In: NIAHO interpretive guidelines and surveyor guidance. 10.1st ed. Milford, OH: DNV Healthcare Inc.; 2012:70-71.		Acc	N/A	N/A	N/A	N/A	N/A	N/A

Recommendation XIII

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
American association of tissue banks. sample procedure: Handling autologous bone skull flaps. version 14 . . August 2012.	This sample procedure is based on the AATB current Standards for Tissue Banking and practices used at AATB-accredited tissue banks. They are only examples and should be viewed only as recommendations. The practices and recommendations included in this document do not represent the sole approach; alternative approaches may be used. This document is offered as a guideline for use when developing procedures.	IVC	Clinical practice guideline	Any and all forms of tissue banking: retrieval, storage and distribution of human tissues for medical use	N/A	N/A	N/A	N/A
Centers for Medicare & Medicaid Services. State operations manual appendix A—Survey protocol, regulations and interpretive guidelines for hospitals. . Rev. 105; 3/21/14.		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Centers for Medicare & Medicaid Services. State operations manual appendix L: Guidance for surveyors: Ambulatory surgical centers. . Rev. 99; 1/31/14.		Reg	N/A	N/A	N/A	N/A	N/A	N/A
HR.01.05.03: Staff participate in ongoing education and training. In: Comprehensive accreditation manual: CAMAC for ambulatory care. 2014th ed. Oakbrook Terrace, Ill.: Joint Commission Resources; 2014.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
Joint Commission. HR.01.05.03: Staff participate in ongoing education and training. In: Comprehensive accreditation manual : CAMH for hospitals. 2014th ed. Oakbrook Terrace, Ill.: Joint Commission Resources; 2014.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
Joint Commission. Transplant safety. In: Comprehensive accreditation manual for ambulatory care E-dition. March 2014 ed.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
Joint Commission. Transplant safety. In: Comprehensive accreditation manual for hospitals E-dition. March 2014 ed.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
MS.10 continuing education. In: NIAHO interpretive guidelines and surveyor guidance. 10.1st ed. Milford, OH: DNV Healthcare Inc.; 2012:24.		Acc	N/A	N/A	N/A	N/A	N/A	N/A

Recommendation XIII

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Quality management and improvement. In: 2014 accreditation handbook for ambulatory health care. Skokie, IL: Accreditation Association for Ambulatory Health Care; 2014:32-36.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
Standards of perioperative nursing practice. In: Perioperative standards and recommended practices. Denver, CO: AORN; 2014:3-42.	It is the perioperative RN's responsibility to meet these standards, assuming that adequate environmental working conditions and necessary resources are available to support and facilitate the nurse's attainment of these standards.	IVB	Clinical practice guideline	Perioperative RNs	N/A	N/A	N/A	N/A

Recommendation XIV

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
21 CFR 1271: Human cells, tissues, and cellular and tissue-based products.(April 2012).		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Accreditation Association for Ambulatory Health Care.,. Surgical and related services. In: Accreditation handbook for ambulatory health care. Skokie, Ill.: Accreditation Association for Ambulatory Health Care; 2014:52-55.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
American Association of Tissue Banks. (2012). Standards for tissue banking. McLean, Va.: American Association of Tissue Banks.	The sharing of experiences and best practices, education, and a quality culture has led to maintaining a template that is referenced by tissue banks, health care facilities, standards-setting associations and regulators worldwide.	IVC	Clinical practice guideline	Any and all forms of tissue banking: retrieval, storage and distribution of human tissues for medical use	N/A	N/A	N/A	N/A
Centers for Medicare & Medicaid Services. State operations manual appendix A—Survey protocol, regulations and interpretive guidelines for hospitals. . Rev. 105; 3/21/14.		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Centers for Medicare & Medicaid Services. State operations manual appendix L: Guidance for surveyors: Ambulatory surgical centers. . Rev. 99; 1/31/14.		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Clinical records and health information. In: 2014 accreditation handbook for ambulatory health care. Skokie, IL: Accreditation Association for Ambulatory Health Care; 2014:37-39.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
Food and Drug Administration. (2012). Current good tissue practice (CGTP) and additional requirements for manufacturers of human cells, tissues, and cellular and tissue-based products (HCT/Ps)		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Joint Commission. Transplant safety. In: Comprehensive accreditation manual for ambulatory care E-dition. March 2014 ed.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
Joint Commission. Transplant safety. In: Comprehensive accreditation manual for hospitals E-dition. March 2014 ed.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
MS.16 medical record maintenance. In: NIAHO interpretive guidelines and surveyor guidance. 10.1st ed. Milford, OH: DNV Healthcare Inc.; 2012:29.		Acc	N/A	N/A	N/A	N/A	N/A	N/A

Recommendation XIV

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
RC.01.01.01: The hospital maintains complete and accurate medical records for each individual patient. In: Hospital accreditation standards 2014. 2014th ed. Oakbrook Terrace, IL: Joint Commission Resources; 2014.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
RC.01.01.01: The organization maintains complete and accurate clinical records. In: Standards for ambulatory care 2014 : Standards, elements of performance scoring accreditation polices. Oakbrook Terrace, IL: Joint Commission Resources; 2014.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
Recommended practices for perioperative health care information management. In: Perioperative standards and recommended practices. Denver, Colo.: AORN; 2013:387-408.	Documentation includes related information about the patient's current and past health status, nursing diagnoses and interventions, expected patient outcomes, and evaluation of the patient's response to perioperative nursing care.	IVB	Clinical practice guideline	Perioperative RNs	N/A	N/A	N/A	N/A

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
21 CFR 1271: Human cells, tissues, and cellular and tissue-based products.(April 2012).		Reg	N/A	N/A	N/A	N/A	N/A	N/A
42 CFR 493 - condition of participation: Laboratory requirements. . 2012.		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Aggarwal VK, Higuera C, Deirmengian G, Parvizi J, Austin MS. Swab cultures are not as effective as tissue cultures for diagnosis of periprosthetic joint infection. Clinical Orthopaedics & Related Research. 2013;471(10):3196-3203.	Tissue cultures demonstrated higher sensitivity, specificity, positive predictive value, and negative predictive value for diagnosing periprosthetic joint infection than swab cultures.	IIIB	Nonexperimental	Patients undergoing revision arthroplasty procedures	Swab cultures	Tissue cultures	117	Frequency of positive and negative cultures/sensitivity, specificity, and predictive values/microorganisms isolated
American Association of Tissue Banks. (2012). Standards for tissue banking. McLean, Va.: American Association of Tissue Banks.	The sharing of experiences and best practices, education, and a quality culture has led to maintaining a template that is referenced by tissue banks, health care facilities, standards-setting associations and regulators worldwide.	IVC	Clinical practice guideline	Any and all forms of tissue banking: retrieval, storage and distribution of human tissues for medical use	N/A	N/A	N/A	N/A
American association of tissue banks. sample procedure: Handling autologous bone skull flaps. version 14 . . August 2012.	This sample procedure is based on the AATB current Standards for Tissue Banking and practices used at AATB-accredited tissue banks. They are only examples and should be viewed only as recommendations. The practices and recommendations included in this document do not represent the sole approach; alternative approaches may be used. This document is offered as a guideline for use when developing procedures.	IVC	Clinical practice guideline	Any and all forms of tissue banking: retrieval, storage and distribution of human tissues for medical use	N/A	N/A	N/A	N/A
Centers for Medicare & Medicaid Services. State operations manual appendix A—Survey protocol, regulations and interpretive guidelines for hospitals. . Rev. 105; 3/21/14.		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Centers for Medicare & Medicaid Services. State operations manual appendix L: Guidance for surveyors: Ambulatory surgical centers. . Rev. 99; 1/31/14.		Reg	N/A	N/A	N/A	N/A	N/A	N/A

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
Chiang HY, Steelman VM, Pottinger JM, et al. Clinical significance of positive cranial bone flap cultures and associated risk of surgical site infection after craniotomies or craniectomies. J Neurosurg. 2011;114(6):1746-1754.	Operative factors, such as the way the skin is prepared before the incision, rather than the skin flora contaminants on bone flaps may play an important role in the pathogenesis of infection after craniectomy.	IIA	Nonexperimental	Patients undergoing craniectomy between November 2007 and November 2008 at the University of Iowa Hospitals and Clinics	Replanting cranial bone flaps with positive cultures	N/A	377	Infection
Dennis JA, Martinez OV, Landy DC, et al. A comparison of two microbial detection methods used in aseptic processing of musculoskeletal allograft tissues. Cell Tissue Bank. 2011;12(1):45-50.	The liquid culture method is superior to swab cultures in microbial detection.	IIB	Nonexperimental	Musculoskeletal donors	Swab cultures	Liquid cultures	78	Microbial detection
Food and Drug Administration. (2012). Current good tissue practice (CGTP) and additional requirements for manufacturers of human cells, tissues, and cellular and tissue-based products (HCT/Ps)		Reg	N/A	N/A	N/A	N/A	N/A	N/A
International Organization for Standardization. . Sterilization of medical devices : Microbiological methods. part 1, partie 1, part 1, partie 1, Geneva: International Organization for Standardization; 2006.	Culture swabbing is prone to errors.	IVC	Clinical practice guideline	International users requiring guidance of the enumeration and microbial population on or in a medical device, component, raw material, or package	N/A	N/A	N/A	N/A
Joint Commission. Transplant safety. In: Comprehensive accreditation manual for ambulatory care E-dition. March 2014 ed.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
Joint Commission. Transplant safety. In: Comprehensive accreditation manual for hospitals E-dition. March 2014 ed.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
MedWatch: The FDA safety information and adverse event reporting program. http://www.fda.gov/safety/medwatch/default.htm . Accessed 7/14/2014, 2014.		Reg	N/A	N/A	N/A	N/A	N/A	N/A
Nguyen H, Morgan DA, Cull S, Benkovich M, Forwood MR. Sponge swabs increase sensitivity of sterility testing of processed bone and tendon allografts. J Ind Microbiol Biotechnol. 2011;38(8):1127-1132.	Sponge sampling should be applied as the standard for sterility testing of structural bone and tendon allografts.	IIB	Quasi-experimental	Bone and tendon allografts from cadaveric donors	Nasco sponges	Swab cultures	81	Microbial detection
PI.03.01.01: The hospital improves performance on an ongoing basis. In: Hospital accreditation standards 2014. 2014th ed. Oakbrook Terrace, IL: Joint Commission Resources; 2014.		Acc	N/A	N/A	N/A	N/A	N/A	N/A

CITATION	CONCLUSION(S)	CONSENSUS SCORE	EVIDENCE TYPE	POPULATION	INTERVENTIONS	COMPARISON	SAMPLE SIZE	OUTCOME MEASURE
PI.03.01.01: The organization improves performance. In: Standards for ambulatory care 2014 : Standards, elements of performance, scoring, accreditation polices. Oakbrook Terrace, IL: Joint Commission Resources; 2014.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
Quality management system. In: NIAHO interpretive guidelines and surveyor guidance. 10.1st ed. Milford, OH: DNV Healthcare Inc.; 2012:10-16.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
Quality management and improvement. In: 2014 accreditation handbook for ambulatory health care. Skokie, IL: Accreditation Association for Ambulatory Health Care; 2014:32-36.		Acc	N/A	N/A	N/A	N/A	N/A	N/A
Ronholdt CJ, Bogdanský S. The appropriateness of swab cultures for the release of human allograft tissue. Journal of Industrial Microbiology and Biotechnology. 2005;32(8):349-354.	Swab systems exhibited low and highly variable recoveries from the seeded allograft tissues.	IB	Randomized controlled trial	Human allograft tissues consisting of cut-tissues (eg, tricortical wedges, femoral heads) and soft tissues (eg, fascia, achilles tendon)	Two different types of swab systems	Positive controls: Inoculated swabs/Negative controls: Noninoculated swabs	168	Microbial recovery
Stotler BA, Reich-Slotky R, Schwartz J, et al. Quality monitoring of microbial contamination of cryopreserved parathyroid tissue. Cell & Tissue Banking. 2011;12(2):111-116.	Quality monitoring using this protocol is a useful tool to identify tissues contaminated with bacteria.	VB	Organizational experience	Patients undergoing subtotal or total parathyroidectomy as a method to prevent severe, postoperative hypocalcemia	Quality monitoring protocol for sterility of cryopreserved parathyroid tissue	N/A	47	Identification of cryopreserved parathyroid tissues contaminated with bacteria
Tissue guidances > guidance for industry: MedWatch form FDA 3500A: Mandatory reporting of adverse reactions related to human cells, tissues, and cellular and tissue-based products (HCT/Ps). Retrieved 10/22/2012		Reg	N/A	N/A	N/A	N/A	N/A	N/A