An Inter-organizational Knowledge Sharing Model for Sustainable Workplace Safety

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Abstract: Workplace safety recommendations and regulations are constantly evolving. This paper reviews workplace safety literature on safety culture and inter-organizational knowledge sharing among healthcare organizations. The research question asks, *how does sustainable workplace safety occur in a healthcare* setting? The findings of the literature review assisted in the creation of a model to promote a culture of safety within healthcare fields and moved beyond individual organizations to support sustainable workplace safety practices. The context of hazardous drug handling is used as an example for model application throughout the paper. The C^2oST^3 model promotes *collaboration* among and within organizations to promote a *culture of safety* (C^2oS) through *transfer* (T), *translation* (T), and *transmission* (T) of knowledge.

Keywords: knowledge sharing, inter-organizational learning, culture of safety, healthcare

In the United States, organizations, such as the Occupational Safety and Health Administration (OSHA) and The National Institute for Occupational Safety and Health (NIOSH), continuously evaluate the safety of handling potentially harmful substances, including hazardous drugs in medical practices. Engaging current best practices for handling hazardous materials is important for the health and safety of workers. It is critical that updates about materials considered hazardous reach all impacted audiences. Although OSHA and NIOSH's standards and guidelines are made public, not all hazardous products are listed, exposing a lack of information and a gap in knowledge when medical practices update their hazardous handling protocols. Beyond knowledge distribution, processes are required to ensure the integration of knowledge into practice to support a culture of safety. To surface these processes, our research question asked: How does sustainable workplace safety occur in a healthcare setting?

Literature Review

This paper draws from the current literature on culture of safety, knowledge sharing, and inter-organizational learning; and proposes a model for inter-organizational knowledge sharing for sustainable workplace safety. We propose collaborative networks for reaching into siloed medical and veterinary practices to promote a safety culture. The authors adopt an ecological approach to the problem, aligning with the One Health Initiative; "a movement to forge co-equal, all-inclusive [*sic*] collaborations between physicians, osteopathic physicians, veterinarians, dentists, nurses, and other scientific-health and environmentally related disciplines" (One Health Initiative, 2021, para. 1). Inter-organizational collaborations are needed to properly address changes in our global context and how organizations access and use information (van Winkelen, 2010).

Learning collaborations can be an effective means for sharing policies and concrete knowledge (Van Wijk et al., 2008), and they also create the potential for social networking and tacit knowledge sharing (Allee, 2000). Both types of knowledge sharing are necessary in the case of cultivating a culture of safety spanning organizations. Although our model's primary aim is to distribute knowledge about hazardous drugs, collegial connections across medical specialties in the spirit of the One Health Initiative are necessary for fostering sustainable networks and workplace safety.

Knowledge goes beyond information. Knowledge includes beliefs, promises, actions, and meaning (Nonaka, 1994). Nonaka (1994) analyzed the dynamics of organizational knowledge creation. Nonaka found knowledge is created through continuous social interactions between tacit knowledge and explicit knowledge, and by inducing knowledge-sharing activities between organization members. Knowledge sharing is a process where individual members of the organization not only possess their own knowledge but also expand the scope of knowledge through exchange relations with others, thereby pursuing the interests of both members of an organization and the whole organization. It is important to recognize knowledge sharing as an iterative, recursive process.

A culture of safety has been defined as "the attitudes, beliefs, perceptions, and values the employees *share* in relation to safety" (Cox & Cox, 1991, p. 93). Safety culture develops through knowledge sharing, informed decisions, open communications, and feedback from individuals, groups, and teams within learning organizations with shared visions, missions, and values. One way to promote a culture of safety within the work environment is via workplace safety education. The perceived importance of safety has been described as the safety climate (DeJoy et al., 2017; Lee et al., 2019). According to Beus et al. (2016), workplace safety is defined "as an attribute of work systems reflecting the (low) likelihood of physical harm—whether immediate or delayed—to persons, property, or the environment during the performance of work" (p. 353). When relating to the aspects of One Health, the definition can be understood as corresponding with the health of humans, animals (property), and the environment.

Methodology

Inclusion criteria established prior to data collection focused on selecting English language literature for factors influencing knowledge sharing and workplace safety to enhance a culture of safety. Inclusion criteria limited the subject of analysis search to empirical research published in academic journals and excluded research not found in a peer-reviewed journal. We excluded articles lacking empirical or theoretical research. To identify relevant resources, we employed academic search engines, including Google Scholar and the University of Georgia Libraries' databases. Knowledge transfer and knowledge sharing are sometimes used synonymously or are considered to have overlapping content (Paulin & Suneson, 2011). Therefore, in this study, we used search terms 'knowledge sharing', 'knowledge transfer', 'knowledge exchange', and 'workplace safety'. We added keywords 'inter-organizational knowledge sharing', 'veterinary', and 'healthcare'. We limited inclusion results to studies from 2000 to 2021 and obtained 39 academic papers.

Data Collection and Analysis

Of the 39 academic papers, we excluded non-empirical studies and analyzed 9 relevant to our focus on knowledge sharing within healthcare settings. We constructed a guiding research framework for the analysis of articles meeting the literature review purpose. After the collection of the articles, we detailed each article's content into categories: (a) author and year; (b) organization and purpose (c) focus variable; (d) research methods; and (e) findings.

We analyzed current literature on knowledge sharing in healthcare settings to determine potential variables contributing to sustainable workplace safety. We used an integrative literature review to group variables related to knowledge sharing and workplace safety. An integrated literature review is a research method used to present a new conceptual model or perspective by comprehensively reviewing, evaluating, and synthesizing literature related to the subject. An integrative literature review is an appropriate method when a topic has been discussed for a considerable length of time and continues to expand and diversify; when consideration and reconceptualization are required; or when an overall concept or document integration on a newly emerging topic is warranted (Torraco, 2016).

This paper took a synthesizing integrative approach by reviewing new and emerging topics and joined them in a model to support sustainable workplace safety (see Figure 1 under Recommendations for Practice). In this study, the criteria for the analysis target were first established, and data were collected and selected based on established criteria. Synthesizing the results, we extracted data to design a conceptual integrative workplace safety model using factors influencing knowledge sharing and enhancing a culture of safety.

Findings and Recommendations

Of the nine studies analyzed, seven researched knowledge sharing explicitly with three focusing on inter-organizational knowledge sharing. Three studies contained content related to safety culture or safety climate with one mentioning knowledge transfer (mobilization) and another knowledge sharing. Seven countries were represented across the studies: Canada, Jordan, Korea, Netherlands, Oman, Taiwan, and the United States. Based on the literature review, we created a conceptual sustainable workplace safety model (Figure 1) to promote a culture of safety within healthcare organizations, specifically workplace safety related to hazardous drugs, by exploring knowledge sharing. Studies on KS were plentiful, allowing us to narrow our focus to the healthcare context. We analyzed three studies for variables affecting KS in healthcare. We noticed subjective norms affect the likelihood of KS more than attitude or perceived behavioral control (Ryu et at., 2003). There are direct or indirect positive effects on KS when psychological ownership, empowerment, and autonomous motivation are present (Wu et al., 2021). Other positive effects on KS included the behavior of participants expressing conscientiousness, extraversion, and agreeableness (Harb et al., 2021).

We found three studies addressing inter-organizational KS specifically in healthcare. Of these, we noticed studies focused on computer systems for facilitating KS revealed the importance of the human factor (Al-Busaidi, 2014; Al-Busaidi & Olfman, 2017). Al-Busaidi (2014) assessed knowledge workers' perceptions of potential benefits and challenges of inter-organizational

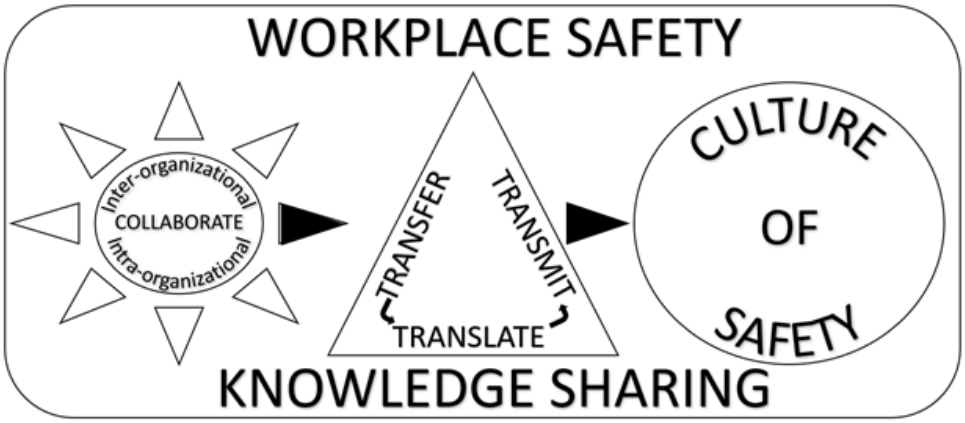
knowledge systems (IOKSS) using the Delphi method. Cultural and social aspects of knowledge workers have significant direct impacts on the intention to share knowledge through IOKSS (Al-Busaidi & Olfman, 2017). Eussen et al. (2017) determined defining common goals is a factor for greater collaborations and can be enhanced by engaging in knowledge sharing and identifying common responsibilities.

Three studies in the healthcare context focused on safety. Lee et al. (2019) examined mediating effects of KS between empowering leadership and safety behavior and found a positive influence on safety climate. Another positive effect on safety climate included management's greater levels of commitment to safety culture, and knowledge of hazards must be accompanied by appropriate safety actions (DeJoy et al., 2017). Transfer of knowledge via knowledge mobilization in combination with the actions of leaders can facilitate a more positive safety culture (Fazel et al., 2021).

Recommendations for Practice

Returning to our chosen context of HDs in medical contexts, inter-organizational knowledge sharing via educational opportunities (e.g., continuing education, workshops) is a recommended viable method to increase knowledge about handling hazardous drugs in human medical and veterinary practice settings. It is proposed, designated individuals from the practice setting would receive transferred knowledge from an inter-organizational learning opportunity; translate the information into practical application; and transmit the need, urgency, and practices within their own organization (van Winkelen, 2010).

Figure 1
C^2oST^3 Model for Sustainable Workplace Safety



Note: C^2 = **C**ollaborate, **C**ulture; oS = **o**f **S**afety; T^3 = **T**ransfer, **T**ranslate, **T**ransmit

A theoretical example of how this can be accomplished is if a hospital has a designated individual (e.g., board-certified veterinary oncologist) serving the organization as an expert related to handling hazardous substances. A new hazardous substance is released on the market of interest to the organization. With the **transfer** of knowledge among **collaborating** experts, the information can be **translated** by the expert of the organization to practical applications within their organization (e.g., product innovation, hazardous drug list updated). With resources (e.g., funding) and support of leaders within the organization (e.g., removal of barriers to

implementation), the expert arrives back at the hospital and **transmits** information about the hazardous substance throughout the organization and within target departments handling the substance hands-on (e.g., receiving to disposal); and gathers feedback with open communication and reflection to improve the processes.

When the target departments engage with the development of a process keeping workers safe and fit within their workflow with minimal disruption, there is likely to be a more positive uptake of the new hazardous substance and reinforcement of the **culture of safety**. From this scenario, using the C^2oST^3 model (**c**ollaborate, the **c**ulture **o**f **s**afety, **t**ransfer, **t**ranslate, **t**ransmit) presented in Figure 1 guides sustainable workplace safety system enhancement via knowledge sharing.

Discussion and Implications

Our findings suggest sustainable workplace safety is facilitated by knowledge sharing. This integrative literature review used a synthesis approach to meld the literature on knowledge sharing and safety culture with the literature on inter-organizational knowledge sharing in healthcare to create a model for sustainable workplace safety. The model incorporated inter-and intra-organizational knowledge sharing to enhance a culture of safety. The dearth of literature on KS of safety information in healthcare is a limitation of this work.

Knowledge sharing about safety practices in healthcare is lacking in the literature and is an important area for expansion. More conceptual and empirical work is needed. Testing and measurement of the C^2oST^3 model are encouraged. Testing aspects within the model could include Kramer et al.'s (2013) proposed conceptual model as an evaluation tool to assess knowledge transfer and exchange interventions. Measurements of learning transfer could be tested by using the Learning Transfer System Inventory (Holton III et al., 2000) as well. A culture of learning within an organization is an essential component of facilitating knowledge sharing. Communication and collaboration between organizations are fruitless if the organizational environment is not open to learning and change based on updated information (Beesley, 2004).

To determine if the organization has attributes of a learning organization, the validated Dimensions of the Learning Organization Questionnaire (Watkins & Kim, 2018) could be employed as a gap analysis tool to determine readiness for learning. The learning organization, having a culture of learning, seeks both internal and external knowledge for continuous learning opportunities and success within the organization (Iftikhar & Ahola, 2020). Having foundational intra-organizational knowledge sharing experience can facilitate more productive inter-organizational knowledge sharing (van Winkelen, 2010). From our review of the literature, we found sustainable workplace safety occurs in healthcare settings by leaders fostering a culture of safety. For sustainable workplace safety to prevail, leaders must facilitate a culture of safety by acting. The C^2oST^3 model can be used as a template for guiding iterative and recursive actions to protect humans, animals, and the environment.

References

Al-Busaidi, K. A. (2014). Knowledge workers' perceptions of potential benefits and challenges of inter-organizational knowledge sharing systems: a Delphi study in the health sector. *Knowledge Management Research & Practice, 12*(4), 398-408. https://doi.org/10.1057/kmrp.2013.4

Al-Busaidi, K. A., & Olfman, L. (2017). Knowledge sharing through inter-organizational knowledge sharing systems. *VINE Journal of Information and Knowledge Management Systems*, *47*(1), 110-136. https://doi.org/10.1108/VJIKMS-05-2016-0019

Allee, V. (2000). The value evolution: Addressing larger implications of an intellectual capital and intangibles perspective", J*ournal of Intellectual Capital, 1*(1), 17-32. https://doi.org/10.1108/14691930010371627

Beesley, L. (2004), Multi-level complexity in the management of knowledge networks, *Journal of Knowledge Management, 8*(3), 71-100. https://doi.org/10.1108/13673270410541051

Beus, J. M., McCord, M. A., & Zohar, D. (2016). Workplace safety: A review and research synthesis. *Organizational Psychology Review*, *6*(4), 352-381. https://doi.org/10.1177/2041386615626243

Cox, S., & Cox, T. (1991). The structure of employee attitudes to safety: A European example. *Work & Stress, 5*(2) 93-106. https://doi.org/10.1080/02678379108257007

DeJoy, D.M., Smith, T. D., Woldu, H., Dyal, M-A., Steege, A. L., & Boiano, J. M. (2017). Effects of organizational safety practices and perceived safety climate on PPE usage, engineering controls, and adverse events involving liquid antineoplastic drugs among nurses. *Journal of occupational and Environmental Hygiene, 14*(7), 485-493. https://doi.org/10.1080/15459624.2017.1295496

Esmaeilzadeh, P., Sambasivan, M., Kumar, N., & Nezakhati, H. (2011, December). Adoption of technology applications in healthcare: the influence of attitude toward knowledge sharing on technology acceptance in a hospital. In *International Conference on U-and E-Service, Science and Technology* (pp. 17-30). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-27210-3_3

Eussen, B. G. M., Schaveling, J., Dragt, M., & Blomme, R. J. (2017). Stimulating collaboration between human and veterinary health care professionals. *BMC Veterinary Research, 13*(174), 1-11. https://doi.org/10.1186/s12917-017-1072-x

Fazel, S. S., Keefe, A., Shareef, A., Palmer, A. L., Brenner, D. R., Nakashima, L., Koehoorn, M. W., McLeod, C. B., Hall, A. L., & Peters, C. E. (2021). Barriers and facilitators for the safe handling of antineoplastic drugs. *Journal of Oncology Pharmacy Practice,* 1-13. https://doi.org/10.1177/10781552211040176

Harb, Y., Zahrawi, A., Shehabat, I., & Zhang, Z. (2021). Managing knowledge workers in healthcare context: role of individual and knowledge characteristics in physicians' knowledge sharing. *Industrial Management & Data Systems, 121*(2), 381-408. https://doi.org/10.1108/IMDS-02-2020-0097

Holton III, E. F., Bates, R. A., & Ruona, W. E. A. (2000). Development of a generalized learning transfer system inventory. *Human Resource Development Quarterly, 11*(4), 333-360.

Iftikhar, R., & Ahola, T. (2020). Knowledge sharing in an interorganizational setting: empirical evidence from the Orange Line metro train project. *Journal of Knowledge Management*. Advance online publication. https://doi.org/10.1108/JKM-06-2020-0485

Kramer, D. M., Wells, R. P., Carlan, N., Aversa, T., Bigelow, P. P., Dixon, S. M., & McMillan, K. (2013). Did you have an impact? A theory-based method for planning and evaluating knowledge-transfer and exchange activities in occupational health and safety. *International Journal of Occupational Safety and Ergonomics, 19*(1), 41-62. https://doi.org/10.1080/10803548.2013.11076965

Lee, Y. H., Lu, T. E., Yang, C. C., & Chang, G. (2019). A multilevel approach on empowering leadership and safety behavior in the medical industry: The mediating effects of knowledge sharing and safety climate. *Safety Science, 117*, 1-9. https://doi.org/10.1016/j.ssci.2019.03.022

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science, 5*(1), 14-37. https://doi.org/10.1287/orsc.5.1.14

Nonaka, I., & Konno, N. (1998). The concept of "Ba": Building a foundation for knowledge creation. *California Management Review, 40*(3), 40-54. https://doi.org/10.2307/41165942

One Health Initiative. (2021). *One Health Initiative will unite human and veterinary medicine.* https://onehealthinitiative.com/

Paulin, D., & Suneson, K. (2011). Knowledge transfer, knowledge sharing and knowledge barriers-three blurry terms in KM. In: *Proceedings of the European Conference on Knowledge Management, ECKM, 2,* 752-760. Accessed July 1, 2021. https://www.researchgate.net/publication/286105137_Knowledge_transfer_knowledge_sharing_and_knowledge_barriers-Three_blurry_terms_in_KM

Ryu, S., Ho, S. H., & Han, I. (2003). Knowledge sharing behavior of physicians in hospitals. *Expert Systems with Applications, 25*(1), 113-122. https://doi.org/10.1016/S0957-4174(03)00011-3

Torraco, R. J. (2016). Writing integrative literature reviews: Using the past and present to explore the future. *Human resource development review*, *15*(4), 404-428. https://doi.org/10.1177/1534484316671606

Van Wijk, R., Jansen, J. J., & Lyles, M. A. (2008). Inter-and intra-organizational knowledge transfer: a meta-analytic review and assessment of its antecedents and consequences. *Journal of management studies, 45(*4), 830-853. https://doi.org/10.1111/j.1467-6486.2008.00771.x

van Winkelen, C. (2010). Deriving value from inter-organizational learning collaborations. *The Learning Organization, 17*(1), 8-23. https://www.emerald.com/insight/content/doi/10.1108/09696471011008215/full/html

Watkins, K. E., & Kim, K. (2018). Current status and promising directions for research on the learning organization. *Human Resource Development Quarterly*, *29*(1), 15-29. https://doi.org/10.1002/hrdq.21293

Wu, S-Y., Wang, W-T., & Hsiao, M-H. (2021). Knowledge sharing among healthcare practitioners: Identifying the psychological and motivational facilitating factors. *Frontiers in Psychology, 12*(736277). https://doi.org/10.3389/fpsyg.2021.736277