

A cura di

MARIA CLAUDIA LUCCHETTI, MARIA FRANCESCA RENZI

QUALITÀ, INNOVAZIONE E SOSTENIBILITÀ NELLA FILIERA AGRO-ALIMENTARE

Il contributo delle Scienze Merceologiche



Roma TrE-Press
2025



Dipartimento di Economia Aziendale



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Università degli Studi Roma Tre
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COLLANA DEL DIPARTIMENTO
DI ECONOMIA AZIENDALE

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*Atti del Convegno dell'Associazione Italiana di Scienze Merceologiche
16-18 novembre 2023*

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2025

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Impaginazione e cura editoriale: Start Cantiere Grafico

Elaborazione grafica della copertina: Mosquito mosquitoroma.it MOSQUITO.

Edizioni: Roma TrE-press©

Roma, marzo 2025

ISBN: 979-12-5977-448-4

<http://romatrepress.uniroma3.it>

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L'attività della *Roma TrE-press* è svolta nell'ambito della
Fondazione Roma Tre-Education, piazza della Repubblica 10, 00185 Roma.

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Improving sustainability in the food supply chain of the healthcare sector: the ISO 22000 and ISO 28000 adoption

Carlotta D'Alessandro

University of Messina

Uwakmfon Promise Offiong

University of Szczecin

Katarzyna Szopik-Depczyńska

University of Szczecin

Giuseppe Ioppolo

University of Messina

ABSTRACT

The climate crisis poses serious threats to human health, and the healthcare sector is a significant contributor to this issue. According to the Healthcare Without Harm report, the supply chain is responsible for 70% of climate pollution related to the healthcare sector. The sustainability of the food supply chain is significantly influenced by food production, distribution, preparation, and consumption. The healthcare food supply chain and the agri-food sector are closely connected and interdependent, through the entire food production and distribution cycle. This study provides an overview of the food supply chain within the healthcare sector. The authors emphasize the imperative of establishing a sustainable food supply chain within the sector, aligned with the ISO standards, to ensure and maintain food quality and safety. To assess the current state of the food supply chain in the healthcare sector, a systematic literature review (SLR) was conducted. The review encompassed the assessment of articles sourced from peer-reviewed journals listed in Scopus and Web of Science. Qualitative analysis was undertaken, to understand food supply chain benefits and challenges. The sustainable management of the food supply chain necessitates a holistic integration of three pillars of sustainability. A solution is the implementation of tailored standards, such as ISO 28000 or ISO 22000, for the preservation of food product integrity and safety throughout the entire supply chain.

KEYWORDS: food supply chain management; sustainability; healthcare sector; ISO standards; literature review.

1 Introduction

The climate crisis is a multifaceted threat to human health, encompassing challenges such as extreme weather events, the proliferation of infectious diseases due to changing climate patterns, and the risk of food and water shortages in vulnerable regions (Berry et al., 2018; FAO, 2015). These issues are a growing concern in the global health community. Certain environmental elements, including variations in temperature, elevated pressure, exposure to radiation, UV sunlight, and excessive moisture levels in the atmosphere, can contribute to the degradation of food quality (Haji et al., 2022).

A critical facet of this crisis centers around the healthcare sector, which is increasingly recognized as a significant contributor to environmental degradation (Eckelman & Sherman, 2016). This recognition highlights a sustainability deficit within healthcare – a shortfall in sustainable practices. Failing to address this deficiency has far-reaching consequences for public health.

The modest presence of sustainable practices within healthcare exacerbates climate-related challenges, leading to extreme weather events, infectious disease outbreaks, and resource scarcity (Duindam, 2022; Sellers et al., 2019). Additionally, it contributes to climate change, further straining resources like clean water, particularly in many regions (FAO, 2015).

Likewise, when delving deeper into the healthcare sector's sustainability challenges, it becomes evident that the crucial issue extends beyond the immediate healthcare facilities themselves. A key component of this larger sustainability picture lies in the healthcare food supply chain. Although the entire supply chain for the healthcare sector is responsible for 70% of the total emissions related to this industry (Health Care Without Harm, 2022), the assessment of the environmental consequences specific to the food supply chain receives little attention. This complex network encompasses activities spanning from identifying customer needs, product selection, supplier negotiations, payment, and storage, to distribution and redistribution (Pinna et al., 2015). Hence, the sustainability of the entire supply chain is greatly affected by how food is produced, processed, transported, and consumed (Rich et al., 2018).

Moreover, there exists a profound interconnection and mutual reliance between the healthcare food supply chain and the agri-food sector, encompassing the entirety of the food production and distribution continuum. Particularly, the term food supply chain is intended for the entire journey of food from production to consumption, whereas the agri-food supply chain focuses specifically on the agricultural sector and the processes associated with growing and handling agricultural products. In this context,

for the research objectives of the study, the term food supply chain is considered more appropriate.

This overlooked topic is in line with the current need for sustainability efforts within the healthcare sector. Indeed, it is required for healthcare institutions to consider sustainability (Molero et al., 2021), adopt environmentally conscious practices, and invest in greener technologies and supply chain management strategies, to reduce waste and their carbon footprints (Jialin et al., 2023). Addressing the healthcare food supply chain's contributions to the climate crisis is not only a moral responsibility but also an essential step toward mitigating the broader negative impacts, yielding benefits in terms of product quality and safety, while safeguarding human health and well-being.

A possible strategic solution identified to deal with these environmental challenges is represented by the voluntary adoption of international standards, such as ISO 22000:2018 and ISO 28000:2022.

ISO 22000 is an international standard, which allows companies to put in place a "food safety management system" (ISO 22000, 2018). Whereas ISO 28000 always represents an international standard, but that determines the requirements for a security management system, inclusively of elements pertinent to the supply chain (ISO 28000, 2022; Ronalter et al., 2023). Implementing in combination these two standards should lead to significant improvement in food quality and safety across all the food life cycle stages, spanning from production to final disposal, effectively handling the challenges posed by the climate crisis. However, how these international standards are adopted and sequentially implemented in this aforementioned context remains unexplored. Therefore, in light of these considerations, the aim of this article is to provide an overview of the current state of the food supply chain within the context of the healthcare sector and then to check the eventual presence of the ISOs and their application.

After this introductory section, Section 2 presents the methodology used, and Section 3 carries out and discusses the results. Finally, Section 4 concludes the paper.

1 Methodology

In this section, it was outlined the methodology employed to investigate the food supply chain within the healthcare sector. The study began with a comprehensive analysis of the food supply chain in the healthcare sector through a systematic literature review (SLR). This approach allows to gather insights from existing research and provide a foundation for our study. To identify relevant sources, a set of keywords and inclusion and

exclusion criteria were developed. Only articles written in English, related to the healthcare sector with a particular focus on its food supply chain were considered. Concerning the document type, reviews articles, Conferences Proceeding, Conference Books, and Book Chapter, with the exception of the grey literature, were included in the sample.

Keywords were applied to the title, abstract, and keywords of publications, using Scopus and Web of Science (WoS).

3 Result and discussion

This section will present the findings and implications of these studies, offering insights into the critical challenges and opportunities for developing a sustainable and resilient healthcare food supply chain. Considering the increasing awareness regarding the necessity to establish a sustainable food supply chain within the healthcare sector, it is worth noting the current scarcity of research in this field.

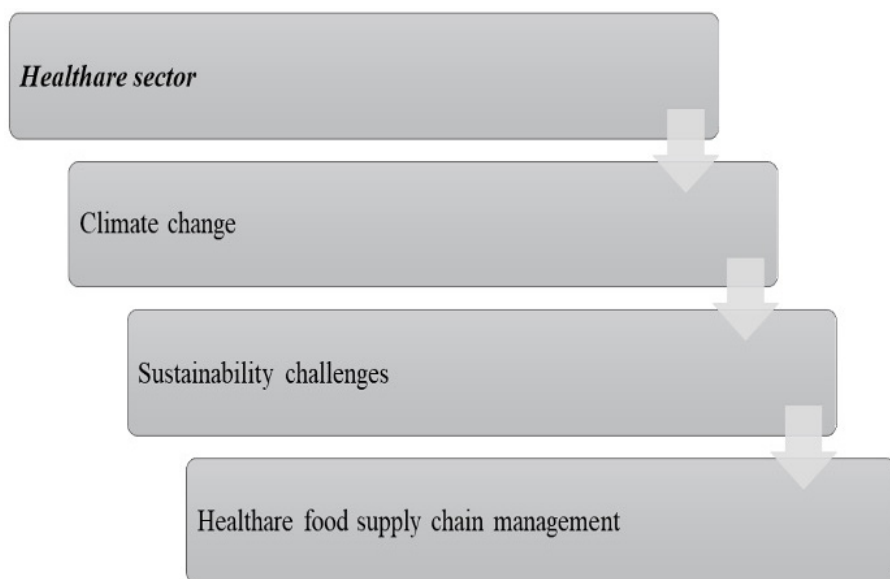


Figure 1 – Main Challenges Within the Healthcare Sector. Visual representation highlights critical areas of concern. Source: Authors' Compilation

Amidst the myriad challenges confronting our planet–population growth, urbanization, environmental health, and human well-being – a re-

sponse emerged in 2015 from the United Nations unveiling the Sustainable Development Goals (SDGs). These goals, slated for attainment by 2030, encompass diverse integrated and indivisible targets, such as poverty eradication, health, education, and food security and nutrition, tackling climate change, while balancing a wide range of economic, social, and environmental objectives (Cf, 2015). Central to these ambitions is the role of the food supply chain, the comprehensive network governing food from production through distribution to consumption. An SLR reveals that, until now, the environmental sustainability investigation within the hospital food and nutrition supply chain has predominantly concentrated on consumption phases, particularly with regard to food waste and local food procurement (Carino et al., 2020). The sustainable food supply chain serves as the basis for minimizing environmental and climatic impacts, preserving biodiversity and ecosystems, and ensuring nutrition security for present and future generations (Carino et al., 2020). A notable blueprint for this transformation is the 2019 report from the EAT – Lancet Commission, which outlines targets for promoting both healthy diets and sustainable food systems. The report's strategies are wide-ranging and encompass international commitments to promote healthy diets, shifts in agricultural priorities, sustainable intensification of food production, integrated governance of land and oceans, and the minimization of food loss and waste (Willett et al., 2019).

Meanwhile, other existing studies have predominantly concentrated on responding to key imperatives: waste reduction, and the integration of emerging technologies. In recent years, there has been a growing emphasis on the issue of food waste (Eriksson et al., 2020). Furthermore, during the preparation and processing phases, food waste tends to arise due to various issues, such as production excess to erroneous expectations, rigid portion size, or legislative restrictions, while after consumption waste is due to training among staff as well as imprecisions when assigning the portion size, or concerns related to food safety (Carino et al., 2021). To boot, in order to reduce food waste in hospitals, it is crucial to introduce incitements and control actions for quantifying food waste. While economic motives may suffice to drive the private sector, the public sector may be more inclined to address environmental worries related to food waste. Implementing mandatory quantification and reporting of food waste quantities, along with a standardized protocol for follow-up, could be a valuable step toward achieving sustainability (Eriksson et al., 2020). Additionally, in the pursuit of food waste reduction, several measures warrant consideration: the consciousness of employees and customers of food waste reduction is crucial in the healthcare sector, managers should enhance the information along the supply chain, increasing the passage of information among departments. Implementing customized food catalogs or menus is desirable to meet patients'

needs. Making commands and transfer processes to accommodate new patient admissions and discharges (Strotmann et al., 2017). Likewise, the incorporation of emerging technologies, such as Artificial Intelligence (AI), the Internet of Things (IoT), or Blockchain, into the healthcare food supply chain holds promise for ushering in a new era of efficiency and sustainability. The IoT technology aims to simplify the process of gathering important food products processing and improve data and their utilization for food security (Bader & Jagtap, 2019). By embracing these technologies, healthcare institutions can not only streamline their food supply chain operations from farm to fork; their implementation encompasses farm production, food transformation, packaging, trade, marketing, transport, delivery, retail, consumer feedback, and waste management (Thibaud et al., 2018), leading to efficient resource utilization. As the healthcare sector places an increasing emphasis on sustainability, the integration of Blockchain, AI, and IoT technologies could represent a forward-thinking approach that aligns with the broader mission of addressing climate-related health risks.

In the pursuit of establishing a sustainable food supply chain within healthcare, previous assessments have also highlighted significant obstacles to change. Often, inefficiencies emerge in the path to sustainability; these can be attributed to a range of factors, including conflicting preferences, inadequate pieces of information, insufficient knowledge and inadequacy of education on opportunities, and policy and funding constraints (Carino et al., 2021). In summary, addressing these obstacles in healthcare's pursuit of a sustainable food supply chain is essential for realizing a future where quality and safety converge to guarantee human well-being, economic efficiency, and environmental protection. Nevertheless, it is important to underscore that despite the need and the benefits of pursuing a sustainable food supply chain within healthcare, the literature on this subject remains limited. The existing studies, while valuable, represent a modest fraction of the comprehensive research needed to exhaustively address this critical issue. This endeavor necessitates an approach, encompassing food quality and safety, and waste reduction. As a different approach to tackling the challenges inherent in establishing a sustainable healthcare food supply chain, it is worth considering the voluntary implementation of internationally recognized standards.

ISO 22000 standard contributes to the enactment of a food safety management system, to ensure that the food will not result in any adverse health effects (ISO 22000, 2018). Food safety refers to the existence of potential hazards, possibly emerging at any point along the food supply chain, in food during the consumption phase. The objective is to create food items of necessary quality standards, assuring they are safe to eat but also appealing in terms of taste, color, and texture (Bader & Jagtap, 2019).

However, negative environmental conditions significantly affect the

quality of food products; their presence can trigger enzymatic or chemical processes that result in food denaturation. The outcome of this denaturation often includes the development of a bitter taste, rendering the affected products unsuitable for consumption. Ingesting denatured food products can lead to severe health complications, including foodborne illnesses that may manifest as gastrointestinal tract infections or severe dehydration, potentially culminating in life-threatening consequences (Haji et al., 2022).

Additionally, radiation exposure stands as a notable risk factor for food products; exposure to radiation can bring about alterations in the active components of food, posing a substantial threat to human health when consumed. This effect arises from the disruption of chemical bonds within food constituents, leading to a loss of stability even before the products are employed (Haji et al., 2022).

Thus, it is imperative to maintain the effective supervision of all actions involved in the chain, requiring the collaboration of all stakeholders within the food industry (ISO 22000, 2018). ISO 22000 offers several benefits such as for example the capacity to steadily deliver secure foods, products, and services, while mitigating risks associated with its objectives (ISO 22000, 2018).

However, from the selected articles in the sample, only one has mentioned the ISO 22000 standard, proposing a survey to assess the level of understanding of the food safety management system; specifically, the study has explored the knowledge degrees and adherence to food safety and hygiene standards, specifically Hazard Analysis and Critical Control Points (HACCP) and ISO 22000:2018, within the Kingdom of Saudi Arabia (Al-rasheed et al., 2021).

Concurrently, implementing ISO 28000:2022 focuses on the criteria for a security management system, regarding among others, the supply chain (ISO 28000, 2022). It oversees compliance with legal, regulatory, and voluntary commitments endorsed by the organization, ascertaining whether sufficient security actions are considered to proficiently handle security-related hazards (ISO 28000, 2022). Simultaneously, ISO 28000 ensures the harmonization of security procedures and controls, extending to relevant processes, both upstream and downstream within the supply chain, to align with the organization's comprehensive aims (ISO 28000, 2022). By proactively addressing security threats and vulnerabilities in the supply chain, ISO 28000:2022 helps prevent disruptions and losses. This, in turn, reduces the need for emergency measures and resource-intensive recovery efforts, promoting a more sustainable and resilient food supply chain. Hence, incorporating these globally recognized standards could foster security, and resilience within the healthcare food supply chain management, enhancing its long-term viability.

Despite their utilization in various industrial contexts, it's noteworthy that these ISO standards have yet to find widespread implementation within the healthcare sector. A paucity of research exists on their application within the healthcare supply chains. These standards offer a comprehensive and structured framework for healthcare facilities to follow.

The voluntary adoption of ISO 22000:2018 and ISO 28000:2022 aligns with global best practices for food safety management systems and security management systems and could enhance the sustainability of the healthcare food supply chain. This dearth of research highlights both the untapped potential and the difficulty for the healthcare sector to embrace these standards. However, further research and exploration are essential to fully unlock the benefits of these standards within the unique context of healthcare food supply chains. By bridging this knowledge gap and advocating for the voluntary implementation of ISO 22000:2018 and ISO 28000:2022, healthcare facilities can proactively handle the pressing challenges they face and contribute to the broader mission of guaranteeing the safety and quality of food products, while enhancing the security management system, to prevent or abate any negative impacts.

To sum up, in the table below, we categorize the vital points from the research outcome into themes, thereby offering a concise and structured summary of the key findings and implications in the context of improving sustainability in healthcare food supply chains. This classification provides a structured guide to the study's key conclusions and ramifications.

Theme	Description
Sustainable Healthcare Food Supply Chain	The importance of developing a sustainable and resilient healthcare food supply chain. The role of the food supply chain in minimizing climate and environmental impacts, ensuring nutrition security, and preserving biodiversity.
Waste Reduction	Challenges related to food waste in healthcare institutions and identifies determinants contributing to it, including staff training. Food waste quantification, employee and customer awareness, customized menus, adaptive order, and transfer processes to reduce waste.

Emerging Technologies	The possible advantages of integrating innovative technologies like Blockchain, AI, and IoT into the healthcare food supply chain. These innovative technologies can optimize waste management, and improve resource allocation, for food safety.
Barriers to change	Inefficiencies in food processing and preparation stages due to various factors such as overproduction and financial constraints. It's vital to overcome these challenges for a future that combines quality, safety, human well-being, economic efficiency, and environmental protection.
ISO Standards	The potential pros of voluntary implementing ISO 22000:2018 and ISO 28000:2022 standards in healthcare food supply chains. The lack of widespread implementation of these standards in the healthcare sector and the need for further research in this area.

Table 1 – Overview of Key Themes and Study Findings.
Source: Authors' Compilation

4 Conclusion

This study has delved into the pressing need for establishing a sustainable and resilient food supply chain within the healthcare sector, addressing critical issues. The global healthcare sector finds itself at a crossroads, where the pressing challenges posed by the climate crisis intersect with the healthcare supply chain, particularly in the context of food safety, and quality. Too often food in healthcare facilities continues to remain a secondary element in which little is invested. The climate crisis, with its far-reaching implications for human health and environmental stability, demands attention from the healthcare sector. A sustainable food supply chain can lead to reducing environmental and climate effects while guaranteeing nutritional security for current and future generations.

In addition, food waste in healthcare settings arises from various issues, including staff training, and can be mitigated through a variety of measures, such as food waste quantification, employee and customer awareness, customized menus, adaptive order, and transfer processes could be adopted practices. Further, incorporating emerging technologies like AI,

IoT, and Blockchain in the healthcare food supply chain should enhance its efficiency and sustainability, managing waste and improving resource allocation. Emerging technologies encompass a wide spectrum, admitting the supervising of their entire food supply chain. Adverse environmental conditions can lead to food denaturation, resulting in a bitter taste and potential health risks.

However, to ensure food quality, safety and resilience, this study has highlighted the integration of internationally recognized standards such as ISO 22000:2018 and ISO 28000:2022 as a path forward. While these standards have found extensive use in various industrial contexts, their application within the healthcare sector remains limited. The implementation of ISO standards signifies a commitment to ensure food safety management systems, and a security management system, to mitigate any unfavorable impacts and diminish the threat of impacting human health, facilitating the path toward a more sustainable food supply chain within the healthcare sector. However, it is essential to recognize that the journey towards a sustainable healthcare food supply chain is still in its early stages. Although this study has provided valuable insights and highlighted the potential of ISO standards, further research, exploration, and implementation are required to unlock the full spectrum of benefits within the unique context of healthcare food supply chains. Healthcare institutions, researchers, policymakers, and stakeholders should collaborate to bridge the knowledge gap and proactively introduce ISO standards. By doing so, the healthcare sector can address pressing challenges, enhance its resilience, and contribute significantly to the broader mission of establishing a sustainable and secure healthcare food supply chain. By embracing sustainability, and introducing ISO standards, both human health and the planet can be safeguarded for the sake of future generations.

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