Introduction

Circular Economy

Linear economy = take-make-use-dispose

Circular economy = extract-make-use-return-reuse

“a sustainable system that eliminates waste by continuously reusing, recycling, and renewing products and materials.”

“It promotes efficient resource use and clean energy, ensuring environmental and economic benefits through collaboration among consumers, industries, and policymakers.”
Introduction
Circular Economy in Healthcare

Why Circular Economy?
- Environmental pollution
- Deterioration of environmental conditions
- Climate change
- Waste generation
- Resource scarcity
- Regulatory Pressures
- Corporate Responsibility
- Economic Benefits
- +++

Why Circular Economy in healthcare?
- Increased use of materials, energy, and resources
- High healthcare expenditures
- Hazardous and non-hazardous waste
- Negative environmental impacts
- Risk of contagious and hazardous waste
- Recycling and reusing materials
- Global efforts
- +++
Rationale and Objectives

• The research and scientific content of the circular economy is unorganized (Korhonen et al., 2018).

• The most important reason for this situation is the increasing number of studies from various scientific fields (Nikolaou et al., 2021).

• To ensure understanding of the concept, it may be beneficial to identify studies done in the field and to systematically examine the studies using reference lists or citations (Suárez-Eiroa et al., 2019).

In this context, the aim of the study is to retrospectively analyze publications on circular economy practices in healthcare institutions by identifying basic thematic clusters and trends, understanding the concept of circular economy in the field of healthcare and leading the studies to be carried out.

<table>
<thead>
<tr>
<th>Method</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Methodology</td>
<td>Systematic review + bibliometric analysis</td>
</tr>
<tr>
<td>Database</td>
<td>Web of Science</td>
</tr>
<tr>
<td>Timeline</td>
<td>No time restriction (search conducted at the end of 2023)</td>
</tr>
<tr>
<td>Protocol</td>
<td>PRISMA Guidelines</td>
</tr>
<tr>
<td>Software</td>
<td>Microsoft Office Excel, EndNote 21, VOSviewer v. 1.6.20</td>
</tr>
</tbody>
</table>
Method

Published in a peer-reviewed journal
In English or Turkish
A research article
Included a circular economy practice in healthcare institutions
Full text available

Not published in a peer-reviewed journal
Not in English or Turkish
Not a research article
Didn’t include a circular economy practice in healthcare institutions
Full text unavailable
Evaluation of reusable of disposables

Quality Assessment: 11 items (min 8 points)
Mean: 8.93 points
Min: 8 points
Max: 11 points

-No study eliminated-

Records identified through database searching
Web of Science (n=17182)

Records after duplicates removed (n=8545)

Records screened (n=6419)

Number of records excluded (n=2126)
- Not English or Turkish (n=880)
- Not published in a peer-reviewed journal (n=979)
- Full text unavailable (n=267)

Full-text records assessed for eligibility (n=210)

Excluded full-text records (n=6209)
- Not about circular economy practices in healthcare institutions (n=5257)
- Not a research article (n=698)
- About the reuse of disposables (n=254)

Records included in the review (n=210)
Bibliometric Analysis Summary

1991–2023
210 articles
999 Authors
146 journals
485 institutions
106 funding agency
56 countries
4491 citations
## Results

### Journals, Co-citation sources analysis

<table>
<thead>
<tr>
<th>Top 10 Journals</th>
<th>Article Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journal of Cleaner Production</td>
<td>10</td>
</tr>
<tr>
<td>Sustainability</td>
<td>10</td>
</tr>
<tr>
<td>Resources Conservation and Recycling</td>
<td>7</td>
</tr>
<tr>
<td>Waste Management</td>
<td>6</td>
</tr>
<tr>
<td>Waste Management Research</td>
<td>5</td>
</tr>
<tr>
<td>Anesthesia and Analgesia</td>
<td>4</td>
</tr>
<tr>
<td>International Journal of Life Cycle Assessment</td>
<td>4</td>
</tr>
<tr>
<td>Surgical Endoscopy and Other Interventional Techniques</td>
<td>4</td>
</tr>
<tr>
<td>Anaesthesia</td>
<td>3</td>
</tr>
<tr>
<td>Science of the Total Environment</td>
<td>3</td>
</tr>
</tbody>
</table>

![Graph showing number of publications over time](image)

- **Articles**: The number of publications is presented over the years from 1991-1995 to 2020-2023.
- **Journals**: The graph highlights the number of publications for different journals.
**Results**

**Countries, Co-authorship country analysis**

<table>
<thead>
<tr>
<th>Top Countries</th>
<th>Article Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>50</td>
</tr>
<tr>
<td>England</td>
<td>25</td>
</tr>
<tr>
<td>Australia</td>
<td>16</td>
</tr>
<tr>
<td>France</td>
<td>16</td>
</tr>
<tr>
<td>Italy</td>
<td>16</td>
</tr>
<tr>
<td>India</td>
<td>15</td>
</tr>
<tr>
<td>Brazil</td>
<td>12</td>
</tr>
<tr>
<td>Germany</td>
<td>12</td>
</tr>
<tr>
<td>Canada</td>
<td>9</td>
</tr>
<tr>
<td>Iran</td>
<td>9</td>
</tr>
<tr>
<td>China</td>
<td>9</td>
</tr>
</tbody>
</table>
Results

Keyword Co-occurrence analysis

reusable, recycling, and waste management appear across various years, reflecting a consistent interest in these topics.

The emergence of sustainability, carbon footprint and life-cycle assessments reflects an evolving trend towards comprehensive environmental strategies.
Results

Bibliographic coupling–documents analysis

dau (2019)

Clusters

Sustainable Practices in Operating Rooms

Waste Disposal, Segregation, and Management

Life Cycle Assessments and Sustainable Practices in Healthcare Equipment

Carbon Footprint Analysis

Environmental Impact of Hospital Waste Streams

Life Cycle Assessment of Packaging and Surgical Instruments

Sustainable Supply Chain Management

eberhardt (2021)
schulte (2021)
chauhan (2021)
unger (2016)
sherman (2018)
eckelman (2012)
tudor (2005)
overcash (2012)
rizan (2021b)
babu (2019)
nast (2019)
gusbeth (2009)
Conclusion

There has been a steady growth in publications over the past decades, with a surge in recent years.

Many studies emphasize waste reduction and sustainable practices in healthcare, focusing on waste segregation, operating room initiatives, the environmental impact of single-use medical devices, life cycle assessments of healthcare equipment, and integrating circular economy principles into sustainable supply chain strategies.

Recycling is found to be the most common practice, highlighting its importance in managing hospital waste.

The trend towards reducing disposable medical equipment use is widely discussed through reusable instrument.
Conclusion

The most used methods include life cycle assessments, observations, comparative analysis, cost evaluations, and interviews.

Technological advancements in healthcare offer opportunities for sustainable practices by reducing environmental footprints through telemedicine, digital health records, and advanced recycling methods.

Longitudinal studies are needed to evaluate the long-term environmental and economic effects of circular economy practices on costs, resource utilization, and carbon footprints over time.

Future research should also extend studies to diverse healthcare settings beyond hospitals or surgical environments to provide a more holistic view of implementation across various sectors globally.
Thank you

Elif ERBAY, Ph.D. Candidate, Ankara University, Türkiye
erbay@ankara.edu.tr