

was intended to allow for probing deeper into relevant topics as they arose during the interviews.

Initial research questions that were presented to the Pilot interviewee:

1. Is the packaging of the medical equipment you use easy to open? If not, what specific challenges do you face?
2. Do you usually read the packaging before opening or using the equipment? Why or why not?
3. What features make the packaging of the equipment you use easier to open?
4. What makes the packaging of the equipment you use easier to see and read?
5. How does your work environment affect your interaction with medical packaging?
6. Can you describe a time when the packaging design (like labels or instructions) either helped or hindered your ability to work with a patient or assist a team member?
7. How did that situation impact your ability to treat the patient or support your team member?
8. Can you provide an example of a product where the packaging design was particularly effective or problematic? Could I take a note or picture of it?
9. Do you have any specific suggestions for improving the packaging of that product?
10. Have you ever been involved in the design process of the medical equipment packaging you use?
11. Do you feel that your needs as a user are being met with the current packaging designs? Why or why not?
12. Would you be willing to provide feedback on packaging if approached by a medical packaging designer? Why or why not?

Annexure A

Please refer to Annexure A for the Pilot Interview transcription.

Pilot Interview Instrument Improvements

During the pilot interview, it was found that some questions (particularly questions 6-9) were repetitive, and question 9 was challenging for the paramedic to answer due to unfamiliarity with design thinking. Based on this feedback, the following adjustments have been made:

- Removal of Question 9: The question asking for general suggestions on improving the product's packaging was removed as it required the paramedic to engage in design thinking, a process they might not be familiar with. This question didn't yield valuable insights and caused confusion during the interview.
- Consolidation of Questions 6-8: Questions 6, 7, and 8 were slightly repetitive in asking about the impact of packaging design on the paramedic's work. These have been streamlined into two questions, focusing on capturing specific examples and understanding the direct impact of packaging on their ability to perform tasks.
- Streamlined Questions: To respect the paramedics' limited time while still gathering valuable insights, I have combined and refined the questions into a smaller number to avoid confusion, repetition and length of the meeting.

Amended Questions

- How easy or difficult is it for you to open and use medical equipment packaging during emergencies? Could you describe any specific features that either help or hinder you in these situations?
- When you need to find and understand information on medical packaging, how do you find the design in terms of visibility, readability, and clarity? Can you recall any instances where the design made a difference in your work?
- How does your work environment affect your interaction with medical packaging, and how does the design of the packaging influence your ability to treat patients or work with your team in emergencies?
- Do you feel that the current packaging designs meet your needs as a user? Would you be open to giving feedback to improve these designs if approached by a designer?

Annexure B

Please refer to Annexure B for the second interview transcription.

Interpretation of Findings in Context

1. Material Accessibility

The findings from the interviews reveal that plastic packaging poses significant challenges for paramedics during emergencies, primarily because it is difficult to open quickly. In contrast, paper or cardboard packaging is generally easier to handle and access under pressure. This issue is particularly critical in emergency situations where time is of the essence, and the ability to quickly access medical supplies can be the difference between life and death.

The literature underscores the importance of ergonomic design in medical contexts, particularly in high-stress environments. Bitan et al. (2019) and Buckle et al. (2006) emphasize that packaging should be designed with ease of use as a priority to facilitate quick and efficient access to medical supplies. When packaging is difficult to open, it can lead to delays in treatment, potentially compromising patient outcomes. The findings from the paramedics' experiences align with these studies, highlighting the need for materials that balance durability with accessibility.

This theme emerged as a critical concern among paramedics, especially in high-pressure scenarios where every second counts. The paramedics' experiences suggest that the material used in packaging directly impacts their ability to perform their duties effectively. In emergencies, the inability to open plastic packaging quickly not only delays the delivery of care but also increases the stress and cognitive load on paramedics. This finding points to a broader issue in packaging design where the focus on durability (as seen with plastic) may inadvertently overlook the practical needs of end-users in the field. Thus, there is a clear need for a re-evaluation of material choices in the design of emergency medical packaging, prioritizing ease of access to improve patient outcomes.

2. Design Features (Visibility, Readability, Security)

Paramedics in the study consistently emphasized the importance of colour-coded packaging in enabling them to quickly identify and use the correct medical supplies. This visual aid is crucial in emergency situations, where the ability to rapidly distinguish between different items can significantly impact the speed and accuracy of the response.

The significance of effective design, particularly in the use of colour-coding, is well-documented in the literature. Lee et al. (2021) and Angouri et al. (2022) discuss how well-

designed packaging that incorporates clear, intuitive visual cues like colour-coding can greatly enhance quick access to necessary supplies and reduce the likelihood of errors. These studies support the paramedics' observations, demonstrating that good design can alleviate the cognitive load on healthcare providers in critical moments.

The paramedics' reliance on colour-coded packaging underscores the importance of visibility and readability in the design of medical supplies. In emergency situations, where paramedics must make rapid decisions under intense pressure, the presence of intuitive, standardized designs can significantly reduce the cognitive load and help prevent errors. However, the findings also revealed that inconsistent designs across similar products are a common source of frustration and can lead to potential mistakes. This inconsistency not only hampers efficiency but also poses risks to patient safety. The findings call for a standardization of design features across manufacturers to ensure that all paramedics, regardless of the brand or type of packaging, can quickly and accurately identify and access the supplies they need.

3. Work Environment and Interaction

The study found that the varying designs and colours used by different manufacturers often create confusion for paramedics, affecting their efficiency and potentially leading to errors. In the chaotic and unpredictable environments in which paramedics operate, these inconsistencies can have serious consequences.

The literature supports the notion that inconsistent packaging design can complicate the use of medical supplies and contribute to errors in emergency settings. Hagiwara et al. (2019) highlights how variability in packaging can lead to confusion and mistakes, particularly in high-pressure situations where paramedics must rely on muscle memory and quick visual cues to perform their tasks effectively.

This theme highlights the critical relationship between the work environment and the usability of medical packaging. Paramedics often work in chaotic and stressful conditions, where the ability to quickly identify and access the correct supplies is paramount. However, when packaging from different manufacturers varies in design and colour, it disrupts the paramedics' workflow and increases the likelihood of errors. The study's findings reveal that these inconsistencies can lead to delays in patient care, as paramedics struggle to navigate unfamiliar or poorly designed packaging. This issue points to a need for greater collaboration among manufacturers to standardize packaging designs, ensuring that all products are

intuitive and easy to use in the field. By addressing these inconsistencies, the healthcare industry can improve the efficiency and effectiveness of paramedic responses, ultimately enhancing patient safety.

4. Evolution of Packaging Design

The study revealed that newer packaging designs, while innovative, often fail to meet the practical needs of paramedics. Issues such as adhesive failure and breakage were commonly reported, particularly with more modern packaging solutions, leading to a preference for older, more reliable designs.

The literature highlights the risks associated with outdated or poorly designed medical packaging, particularly in terms of patient safety and care. Buckle et al. (2006) and Walker et al. (2023) discuss how design flaws in medical packaging can compromise the effectiveness of care and increase the potential for adverse events. These findings resonate with the paramedics' experiences, suggesting that newer designs may prioritize aesthetics or innovation over functionality and reliability.

This theme brings to light a disconnect between the intentions behind modern packaging designs and the real-world needs of paramedics. While innovation in medical packaging is often driven by the desire to improve aesthetics or introduce new features, these changes can sometimes overlook the practical requirements of end-users in the field. The paramedics in the study expressed a clear preference for older designs, which they found to be more reliable and better suited to the demands of emergency medical care. This preference suggests that newer packaging designs may not be adequately tested or refined in real-world scenarios before being introduced to the market. The findings call for a more user-centered approach to the design and development of medical packaging, where the focus is on functionality and reliability rather than solely on innovation. By prioritizing the needs and feedback of paramedics, designers can create packaging that truly enhances patient care and safety.

Research Question, Problem, Hypotheses/Objectives Addressed

The research aimed to explore the challenges and shortcomings faced by paramedics in South Africa concerning emergency prehospital medical equipment packaging and how these issues could impact patient outcomes. The findings provided valuable insights into how packaging design affects paramedic efficiency and patient care, addressing the main research objective. The study identified several key challenges, including the difficulty of opening plastic packaging in emergencies, the need for consistent colour coding, and the variability in packaging designs from different manufacturers.

The first objective, which was to identify and analyse the distinct challenges and shortcomings related to medical equipment packaging, was thoroughly addressed. The findings highlighted that plastic packaging's difficulty in high-pressure situations and inconsistent design features significantly impacted paramedics' ability to perform efficiently. This variability and the lack of intuitive design contributed to delays and potential errors in patient care.

The second objective involved exploring prevalent issues related to packaging malfunction, misuse, and ineffectiveness. The research revealed that newer packaging designs often failed to meet practical needs, such as adhering properly to patients, and that paramedics preferred older, more reliable designs. This underscored the importance of proposing design-oriented solutions that address these issues, emphasizing the need for packaging that balances innovation with real-world functionality.

The third objective was to investigate strategies that local graphic designers and manufacturers could embrace to enhance medical packaging design within the South African healthcare context. The study suggested that a user-centered approach, which considers paramedics' feedback and practical needs, is essential. This approach would involve standardizing design features, improving material accessibility, and ensuring that new designs are thoroughly tested in real-world scenarios. Implementing these strategies could lead to improved healthcare outcomes by enhancing the efficiency and effectiveness of paramedics in emergency situations.

Overall, the research demonstrated how specific design challenges impacted paramedics' performance and patient outcomes. It provided actionable recommendations for graphic designers to address these challenges, emphasizing the need for practical, user-centered designs. The findings suggest that aligning packaging design with the unique needs of the South African healthcare landscape could significantly enhance emergency medical care and patient safety.

In high-pressure emergency situations, the ability to quickly and effortlessly access medical supplies can be the difference between life and death. Paramedics face critical delays and increased stress due to difficult-to-open packaging and inconsistent design features. This highlights the urgent need for packaging that prioritizes ease of use, intuitive design, and reliability, reflecting the real-world challenges paramedics encounter daily.

Anticipated Contribution

This research holds the potential to make a real difference in South African emergency healthcare. By focusing on how graphic designers can improve packaging design for prehospital paramedics, I believe we can bridge a critical gap and ultimately improve patient outcomes. Through this research, I aim to uncover specific areas where graphic design expertise can be leveraged to make packaging more user-friendly and efficient for paramedics in those crucial first moments. This user-centered approach can lead to innovative packaging solutions that prioritize the needs of paramedics and directly translate to faster, more effective treatment for patients. Furthermore, the research can inform the development of locally focused packaging solutions optimized for South Africa's unique healthcare context. Ultimately, this project has the potential to empower graphic designers and improve patient care in South African emergency situations.

In future iterations of this research, several avenues could be explored to further enhance the findings and broaden the scope of the study. One potential direction is to investigate the application of the 7 principles of inclusive design in the context of medical equipment packaging. These principles, which emphasize designing for a diverse range of needs, abilities, and preferences, could address accessibility issues highlighted in the study and provide more adaptable, user-friendly packaging for paramedics. A closer review of the connection between theoretical frameworks, such as Human Factors and Ergonomics (HFE) and the SEIPS model, could also provide a deeper understanding of how these models inform packaging design. By examining how these theoretical concepts align with practical design solutions, the study could offer more targeted recommendations for optimizing packaging to reduce cognitive load and enhance usability in emergency healthcare settings.

Additionally, expanding the focus group of interviewees to include a larger and more diverse sample of paramedics would strengthen the representativeness of the findings. A broader focus group would allow for a more comprehensive exploration of the challenges paramedics face, ensuring that the insights gathered reflect a wider range of experiences across different regions and emergency settings. This expanded sample would also facilitate more robust statistical analysis, helping to validate and generalize the results. Furthermore, incorporating a feedback loop between paramedics and designers or manufacturers could ensure that the perspectives of end-users are directly integrated into the packaging design process. Collaborative workshops or design sessions could create an iterative feedback mechanism, helping designers develop packaging that better meets the needs of paramedics and enhances overall user experience.

Packaging Design in South African EMERGENCY HEALTHCARE



BY KIARA ISHWARLALL

This thesis investigated the impact of medical equipment and medication packaging design on patient outcomes within the South African emergency medical services (EMS) landscape.

MATERIAL ACCESSIBILITY

Plastic packaging is often difficult to open quickly in emergencies, while paper or cardboard is easier to handle.

"In emergencies, every second counts. Plastic is too hard to open under pressure."

DESIGN FEATURES

Colour-coded packaging helps paramedics quickly identify necessary supplies, but inconsistent designs can lead to confusion and errors.

WORK ENVIRONMENT

Variability in packaging design causes confusion, especially under pressure, increasing errors in patient care.

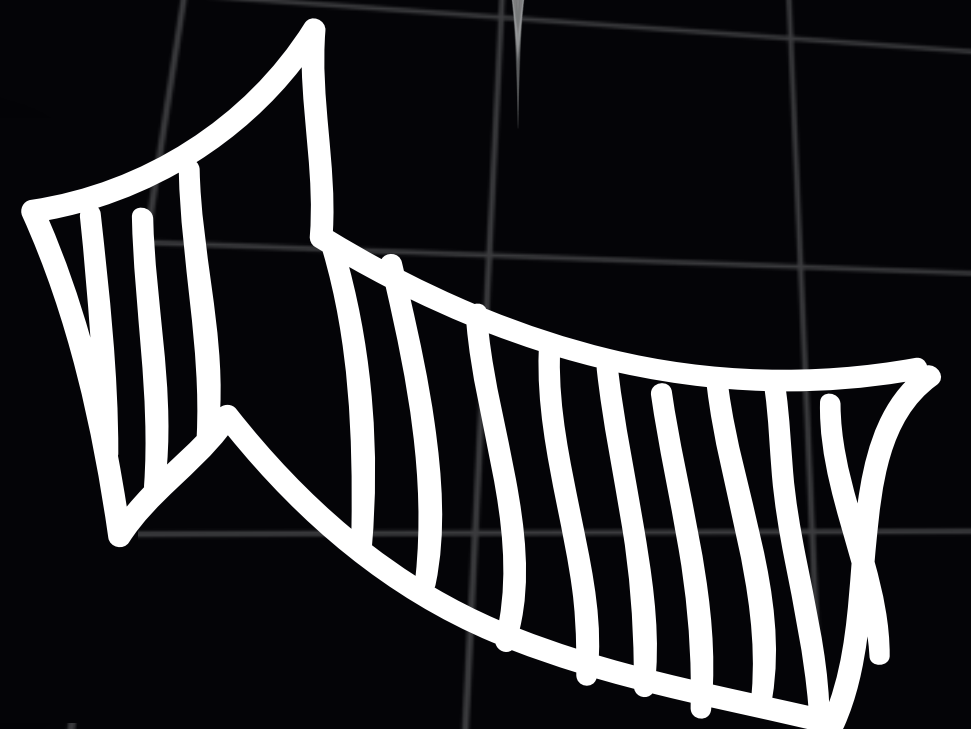
EVOLUTION OF PACKAGING DESIGN

Newer packaging designs often fail in terms of reliability, leading paramedics to prefer older, more durable designs.

The research concluded that a more ergonomic and context-specific approach to packaging design was essential for optimizing patient care in prehospital environments.

ROOM FOR IMPROVEMENT?

- Standardization of Design across manufacturers to improve efficiency.
- User-Centered Design focusing on functionality and usability over aesthetics or innovation.
- More Research and Collaboration with paramedics to ensure practical testing of packaging designs.



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