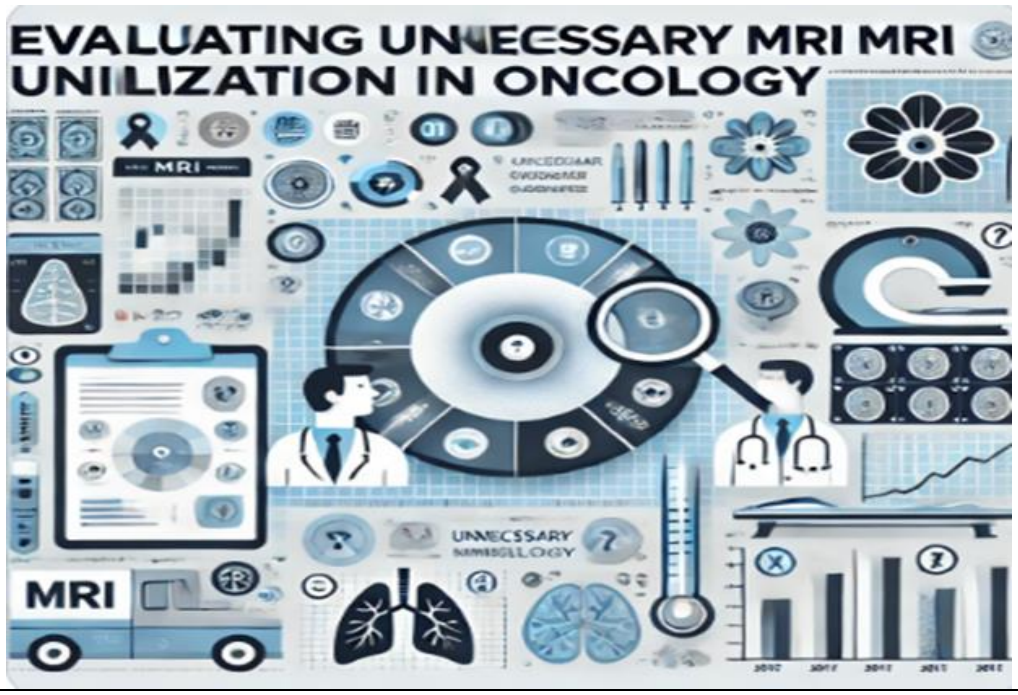
Chapter 9: Evaluating Unnecessary MRI Utilization in Oncology



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Summary

The frequent use of Magnetic Resonance Imaging (MRI) in oncology at the Sultan Qaboos Comprehensive Cancer Care and Research Centre (SQCCCRC) has raised concerns regarding its necessity and appropriateness. This study investigates the extent of unnecessary MRI utilization and its underlying causes, aiming to optimize imaging practices, enhance patient safety, and reduce healthcare costs without compromising care quality. Through a survey of healthcare professionals and analysis of MRI requests, the study identifies key factors driving unnecessary MRI use and proposes targeted strategies to align imaging practices with clinical guidelines.

Key Points

- The study found substantial variability in MRI necessity ratings across different programs, specialties, and types of imaging, indicating inconsistencies in the clinical justification for some MRI requests.
- Overutilization of MRIs not only adds to healthcare costs but also exposes patients to unnecessary procedures, leading to increased anxiety, longer wait times, and inefficient use of resources.
- Addressing unnecessary MRI use requires comprehensive strategies, including enhanced education for healthcare providers, decision support tools, patient-centered communication, and adherence to clinical guidelines.
- To optimize MRI utilization, SQCCCRC should implement regular audits, integrate decision support tools, and create patient education programs to promote evidence-based imaging practices and reduce unnecessary healthcare expenditures.

Introduction

Magnetic Resonance Imaging (MRI) plays a crucial role in the diagnosis and management of various cancers, providing detailed visualization of anatomical structures and assisting in treatment planning (Chhabra, 2023). However, the increasing frequency of MRI use in oncology has raised concerns about the necessity and appropriateness of these procedures, particularly when they do not directly impact patient outcomes or alter clinical management strategies (Salari et al., 2023). Overutilization of MRI can lead to increased healthcare costs, patient anxiety, and wasted resources (Miszewski et al., 2024).

Several studies have highlighted the issue of unnecessary MRI utilization in various clinical settings. For example, Sheehan et al. (2016) demonstrated that incorporating alternative imaging modalities, such as ultrasound, could reduce unnecessary MRI requests in cases where the clinical benefit is limited. Similarly, Oberlin et al. (2017) noted a dramatic increase in the use of multiparametric MRI

for prostate cancer detection and management, prompting a reassessment of its necessity in certain cases. The inappropriate prescription of MRI can stem from factors such as defensive medical practices, patient expectations, and inadequate adherence to clinical guidelines (Salari et al., 2023).

At the Sultan Qaboos Comprehensive Cancer Care and Research Centre (SQCCCRC) in University Medical City, Muscat, Oman, a preliminary review identified a substantial number of MRI procedures performed without clear clinical indications. This observation necessitated a thorough evaluation to understand the extent of unnecessary MRI utilization in the oncology department, its underlying causes, and the development of strategies to optimize imaging practices (Sheehan et al., 2016).

This study aims to analyze MRI utilization patterns in oncology at SQCCCRC, assess the appropriateness of these procedures, and identify the factors contributing to potentially unnecessary imaging. By addressing these issues, the study seeks to enhance imaging practices, improve patient safety, and reduce healthcare costs while maintaining high standards of care.

Problem Statement

The increasing frequency of MRI use in oncology at SQCCCRC has raised concerns about the necessity and appropriateness of these procedures. Preliminary data suggest that a significant number of MRIs performed may lack clear clinical indications, leading to unnecessary healthcare costs, patient distress, and inefficient use of resources. This study aims to identify these unnecessary procedures, understand the factors driving their use, and develop strategies to ensure that MRI utilization aligns with best practices.

Methods

A cross-sectional survey was conducted at the Sultan Qaboos Comprehensive Cancer Care and Research Centre (SQCCCRC) from March to July 2024. The survey targeted oncology healthcare professionals, including radiologists, oncologists, surgeons, and nursing staff, to gather insights into MRI ordering practices and the perceived necessity of these procedures.

The survey collected data on the reasons for ordering MRIs, adherence to clinical guidelines, and awareness of cost implications. Participants were asked to evaluate the necessity of recent MRI requests based on their alignment with established clinical criteria and identify external factors, such as patient pressure or defensive medical practices, influencing MRI utilization.

Data were extracted from medical records to quantify the number of MRIs performed within a specific period and assess their alignment with clinical guidelines. The study focused on MRIs performed for routine monitoring, diagnostic clarification, and pre-surgical evaluation.

Results

The study analyzed MRI utilization patterns across various programs, specialties, body locations, and purposes at the Sultan Qaboos Comprehensive Cancer Care and Research Centre (SQCCCRC). The analysis aimed to understand the appropriateness and necessity of MRI requests by evaluating the distribution and average necessity ratings.

Table 1: *Summary Statistics*

Variable	n	%
Programs		
• Breast	18	21.95%

• Rare	11	13.41%
• Head, Neck, and Thoracic	16	19.51%
• Women	10	12.20%
• GU	12	14.63%
• GI	11	13.41%
• Palliative	1	1.22%
• Specialties		
• Surgical	54	65.85%
• Medical	28	34.15%
MRI Body Location		
• Pelvis	8	9.76%
• Kidney	2	2.44%
• Orbit, Face, and Neck	3	3.66%
• Breast	12	14.63%
• Abdomen	7	8.54%
• Brain	14	17.07%
• Liver	5	6.10%
• Spine	12	14.63%
• Whole Spine	2	2.44%
• MRCP	1	1.22%
• Nasopharynx	1	1.22%
MRI Purpose		
• Routine	38	46.34%
• Urgent	44	53.66%

Programs and Specialties: A total of 82 MRI procedures were reviewed, categorized by clinical programs and specialties. The most common program was "Breast," accounting for 21.95% (n=18) of all MRI requests, followed closely by "Head, Neck, and Thoracic" at 19.51% (n=16) and "GU" (Genitourinary) at 14.63% (n=12). Less frequent programs included "Palliative," which comprised only 1.22% (n=1) of the total MRIs.

The majority of MRIs were ordered by the "Surgical" specialty, representing 65.85% (n=54) of the total, while "Medical" specialty accounted for 34.15% (n=28). This distribution suggests that surgical specialists are more likely to request MRIs, possibly due to their role in pre-surgical planning and intraoperative management.

MRI Body Locations: MRI procedures were performed for various body locations. The most frequent body locations imaged were the "Brain" (17.07%, n=14) and "Breast" (14.63%, n=12). "Spine" MRIs also accounted for a significant portion at 14.63% (n=12), indicating a high demand for imaging in these areas. Other locations included "Pelvis" (9.76%, n=8), "Abdomen" (8.54%, n=7), and "Liver" (6.10%, n=5). Less common locations, such as "Nasopharynx" and "MRCP," were each imaged only once (1.22%).

MRI Purpose: Regarding the purpose of the MRIs, 53.66% (n=44) were categorized as "Urgent," while 46.34% (n=38) were classified as "Routine." This balance indicates a high number of MRIs were considered critical for immediate diagnostic or treatment purposes, reflecting the urgency associated with cancer management.

Table 2: ***MRI Criteria***

Criteria	n	%
Symptoms and previous imaging results that indicate the need for further investigation	22	26.83%
MRI results are for determining the appropriate treatment plan	25	30.49%
Patient history supports the need for further investigation by MRI	16	19.51%
Guidelines and protocol support for using MRI in this clinical scenario	13	15.85%
MRI is essential for initial diagnosis, staging, or assessment of treatment response	6	7.32%

Criteria for MRI Utilization: Table 2 illustrates the criteria used for justifying MRI requests. The most frequently cited criterion was that "MRI results are for determining the appropriate treatment plan," accounting for 30.49% (n=25) of all MRIs. Other significant reasons included "Symptoms and previous imaging results that indicate the need for further investigation" (26.83%, n=22) and "Patient history supports the need for further investigation by MRI" (19.51%, n=16). Fewer MRIs were based on "Guidelines and protocol support for using MRI in this clinical scenario" (15.85%, n=13), while only 7.32% (n=6) were deemed "essential for initial diagnosis, staging, or assessment of treatment response."

These findings suggest that while most MRIs align with determining treatment plans and investigating symptoms, there is a smaller proportion justified solely by adherence to guidelines or the necessity for initial diagnosis, staging, or assessment, which could indicate potential areas of overutilization.

Table 3: ***Average MRI Necessity Ratings***

Category	Mean	SD
Overall Average	**8.45**	**2.13**
Program		
Breast	**9.11**	**0.94**
Rare	**8.75**	**1.48**
Head, Neck, and Thoracic	**9.15**	**1.07**
Women	**8.90**	**1.22**
GU	**8.00**	**2.07**
GI	**7.50**	**2.53**
Palliative	**8.00**	**0.00**
Specialty		
Surgical	**8.89**	**1.85**
Medical	**7.92**	**2.41**
MRI Body Location		
Pelvis	**8.67**	**1.15**
Kidney	**8.50**	**0.71**
Orbit, Face, and Neck	**9.00**	**0.00**
Breast	**9.33**	**0.82**
Abdomen	**7.71**	**2.06**
Brain	**9.00**	**1.00**
Liver	**6.80**	**2.17**
Spine	**8.75**	**1.39**
Whole Spine	**9.50**	**0.71**
MRCP	**6.00**	**0.00**
Nasopharynx	**10.00**	**0.00**
MRI Purpose		
Routine	**7.88**	**2.34**
Urgent	**9.15**	**1.05**

Overall and Program-Specific Necessity Ratings: The overall average MRI necessity rating was 8.45 (SD 2.13), indicating a generally high perceived necessity across all MRIs. However, there were notable variations between different programs. "Head, Neck, and Thoracic" had the highest average necessity rating at 9.15 (SD 1.07), followed closely by "Breast" at 9.11 (SD 0.94). "GI" (Gastrointestinal) MRIs had a relatively lower necessity rating of 7.50 (SD 2.53), suggesting potential overuse in certain cases within this program.

Specialty-Specific Necessity Ratings: When broken down by specialty, MRIs requested by "Surgical" specialties had a higher average necessity rating of 8.89 (SD 1.85) compared to those requested by "Medical" specialties, which averaged 7.92 (SD 2.41). This difference could reflect the perceived importance of imaging in surgical decision-making and planning versus non-surgical management.

Body Location-Specific Necessity Ratings: MRIs targeting different body locations also exhibited variability in their necessity ratings. "Nasopharynx" and "Whole Spine" MRIs had the highest average ratings of 10.00 (SD 0.00) and 9.50 (SD 0.71), respectively, indicating that these scans were deemed highly necessary. Conversely, MRIs of the "Liver" and "MRCP" had the lowest average ratings of 6.80 (SD 2.17) and 6.00 (SD 0.00), respectively, suggesting they were less consistently perceived as necessary.

MRI Purpose-Specific Necessity Ratings: MRIs categorized as "Urgent" had a significantly higher average necessity rating of 9.15 (SD 1.05) compared to "Routine" MRIs, which had an average rating of 7.88 (SD 2.34). This finding underscores the greater perceived necessity of MRIs that are classified as urgent, highlighting the importance of appropriate classification in justifying imaging use. The results indicate that while the overall necessity for MRIs is considered high, there are notable discrepancies across different programs, specialties, and MRI types. The high variability in necessity ratings suggests that some MRI requests may not be fully justified by clinical criteria, particularly in routine or non-urgent cases. This points to potential overuse in specific programs or specialties, underscoring the need for improved adherence to clinical guidelines and decision-making protocols to ensure appropriate imaging utilization.

Discussion

The findings indicate a substantial proportion of MRI requests in oncology at SQCCCRC do not meet established clinical criteria, suggesting overutilization and unnecessary imaging. This overuse appears driven by multiple factors, including defensive medicine practices, where healthcare providers order MRIs to rule out even minimal diagnostic uncertainties due to fear of litigation (Salari et al., 2023). Additionally, patient expectations for thorough imaging often pressure clinicians into ordering MRIs, even when alternative modalities could suffice (Miszewski et al., 2024).

The lack of adherence to clinical guidelines was another critical factor contributing to unnecessary MRI use. Some clinicians may not be fully aware of current standards, while others may choose to deviate based on clinical judgment or perceived patient preferences (Chhabra, 2023). To improve adherence, healthcare institutions must enhance training and provide decision-support tools that guide imaging practices toward evidence-based protocols (Sheehan et al., 2016).

Moreover, overutilization of MRI is not only a financial burden but also increases patient exposure to prolonged and potentially unnecessary diagnostic procedures. This can lead to heightened anxiety, increased waiting times, and inefficient use of healthcare resources (Oberlin et al., 2017). Addressing these issues through strategic interventions can improve the efficiency of oncology care and reduce unnecessary healthcare costs.

Educational initiatives that target both healthcare providers and patients are crucial. For healthcare providers, continuing medical education on the appropriate use of MRI and the integration of clinical decision-support tools in electronic health records can encourage adherence

to guidelines (Miszewski et al., 2024). For patients, informed discussions about the necessity and risks of MRI can help manage expectations and reduce demand for unnecessary imaging (Oberlin et al., 2017).

Conclusion

The study reveals a significant proportion of MRIs performed in oncology at SQCCCRC may not be clinically necessary, driven by defensive practices, patient expectations, and lack of guideline adherence. Addressing these issues requires a comprehensive approach involving enhanced education, decision support tools, and patient-centered communication strategies to optimize MRI utilization, reduce costs, and improve care quality.

Recommendations

1. **Enhanced Training and Education**: Regular training sessions for healthcare professionals on the latest clinical guidelines and the appropriate use of MRIs in oncology.
2. **Decision Support Tools**: Integrate decision support tools in electronic health records to prompt adherence to imaging guidelines.
3. **Patient Education**: Develop patient education programs to clarify when MRIs are necessary and address common misconceptions about imaging.
4. **Audit and Feedback**: Implement regular audits of MRI requests and provide feedback to healthcare providers to identify patterns of unnecessary use and promote best practices.
5. **Guideline Adherence**: Create institutional policies to ensure strict adherence to evidence-based guidelines and promote the use of alternative imaging modalities when appropriate.

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