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Topic 2

Completed Projects

on Engaging Patients for Patient Safety

ENGAGING PATIENTS TO TEST ‘SKYLINER’: A PROTOTYPE DEVICE FOR KNEE SKYLINE X-RAYS

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ABSTRACT

Introduction: The skyline X-ray has a high retake rate (>10%) in the Universiti Malaya Medical Centre, Kuala Lumpur, Malaysia, due to the incompatible positioning devices, thus causing patient movement during exposure. Therefore, this study aimed to examine ‘Skyliner’, a prototype device invented for positioning knee skyline X-rays with patients’ engagement, followed by the specific objectives of reducing the retake rate, radiation dose, time, and cost.

Methods and Materials: The retrospective data of 467 patients who underwent knee skyline X-rays from May to December 2021 were analysed to derive the retake rate and cost incurred. A phantom study compared the dose to sensitive organs between the knee skyline Laurin and Merchant view. The Skyliner, a positioning device invented, was applied to 30 patients using the Merchant view and compared with another 30 patients randomly using the Laurin view without the Skyliner from October 2021 to March 2022. A patient comfort survey was conducted post-application of Skyliner. The retake rate, cost, radiation dose, image quality, and time between both views were compared.

Results: The retake rate of the knee skyline view was 13% in 2021, with a retake cost of approximately RM4000 using the Laurin view. The application of Skyliner documented zero retakes, thus reducing the overall retake rate with an 83% increase in patient comfort level. The Skyliner device reduced radiation dose by >90% compared to the Laurin view (0.001 versus 0.2 mSv, p=0.005). There was no significant difference in the image quality between both studies (p=0.56). However, when using the Skyliner, the positioning time was reduced by 42% (3.5 versus 6.0 minutes, p=0.009).

Discussion and conclusion: The patients’ engagement and feedback using the Skyliner for knee skyline X-rays has reduced the retake rate, thus reducing the cost, providing better comfort with reduced positioning time while maintaining the image quality with less radiation dose.

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INTRODUCTION

- One of the common request for extremities in General Radiography is **knee X-Ray.**
- In the year 2021, knee X-Ray constitutes **13%** of the medical imaging requests for extremities.
- **Skyline view** is a common request of the knee X-Ray projection.
- There is an incidents of **fall impact** of the detectors (the image receptor where the knee x-rays are captured) in Universiti Malaya Medical Centre.

X-Ray detector (weighs between 4 kg) have a **risk of falling** during skyline view positioning

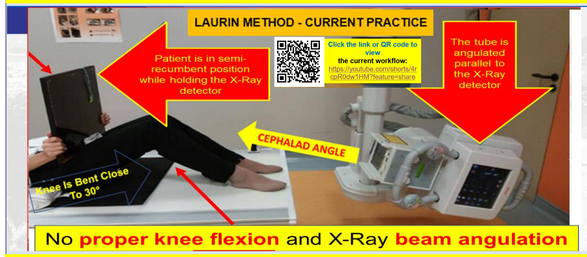




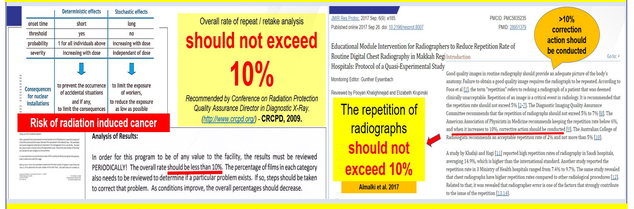
SKYLINE VIEW

Detector was unstable, risk of motion artifact and had high tendency of falling as patient had to hold it in position manually

1. Existing mobility devices are not compatible or ergonomic for some patients, especially patients who are old, weak or not strong



2. High retake rate of skyline view > 10% in UMMC due to blurred image cause by patient movement during exposure



High rates of image rejects in knee and other parts have **implications for management, training, education**, as well as for **quality** - *Hofmann et al. 2015*

General objective:

To test the Skyliner device, a prototype for knee skyline view.

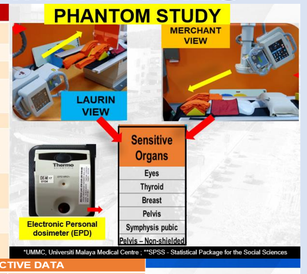
Specific objectives:

To reduce

1. retake rate
2. radiation dose
3. positioning time
4. cost

METHODS AND MATERIALS

ITEMS	RETROSPECTIVE DATA	PROSPECTIVE DATA
	LAURIN VIEW (STANDARD METHOD)	PHANTOM STUDY
Study Design	Quantitative Study	
Study Setting	Department of Biomedical Imaging, *UMMC	
Sample Size	467 Patients	*60 sets of data *30 (Laurin View) + 30 (Merchant View)
Data Collection	May – December 2021.	January - March 2022
Study Tools	X-Ray Console, MS Excel	X-Ray Console, MS Excel, Electronic Personal dosimeter (EPD), **SPSS - Wilcoxon signed-rank test
Data Analysis	1. Image quality – Retake analysis (1) 2. Fall impact - analysis (4)	1. Radiation dose (2)
Inclusion criteria	Patients indicated for knee skyline view	-
Exclusion criteria	Patients with chronic osteoarthritis	-



ITEMS	PROSPECTIVE DATA	
	LAURIN VIEW (CONTROL GROUP)	MERCHANT VIEW (PILOT STUDY)
Study Design	Quantitative Study	
Study Setting	Department of Biomedical Imaging, *UMMC	
Sample Size	30 Patients	
Data Collection	October 2021 - March 2022.	January - March 2022.
Study Tools	X-ray Console, MS Excel, **SPSS – Independent T-test	X-ray Console, MS Excel, SPSS – Independent T-test, SKYLINER
Data Analysis	1. Image quality - Retake analysis (1) 2. Time (3) 3. Cost (4)	4. Feedback form - Post examination knee skyline X-Ray (Patient comfort level)
Inclusion criteria	Patients indicated for knee skyline view	
Exclusion criteria	Patients with chronic osteoarthritis	



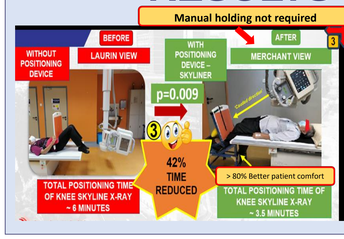




RESULTS



RESULTS – CONT’D



Items Measured	Variables	Standard method (Laurin View)	Customised method (Merchant view)	P-value
Unit of Analysis	Patient (n)	30	30	1.000 (1)
Image Retake	Retake Skyline View (n)	4	0	*0.046 (1)
Image Retake	Image quality			
	Perfect	21	25	0.560
	Good	9	5	
	Moderate	0	0	
	Poor	0	0	
Dose	**Phantom Study (mSv)	0.2	0.001	*0.005 (2)
Actual time	**Positioning time-1 (min.)	5.95	3.54	*0.009 (3)
Additional Retake time	**Positioning time-2 (min.)	0.81	0	*0.001 (3)
Cost	Cost (RM)	160	0	*0.046 (4)

n, number of patients; **mean value; min, minutes; mSv, millisievert; *The significant difference was declared at p < 0.05.

DISCUSSION

SKYLINER FOR KNEE SKYLINE VIEW

1. **Better patient comfort – reduce retake**, similar to study by *Tyson et al. 2011*
2. **Assist in positioning** – **reduced radiation dose** *(Stevens, B. 2015)* by **more than 90%**
3. **Reduced positioning time** *(Dixon et al. 2018)* by **42%**
4. **Safety of detector ensured** – **reduced cost**

CONCLUSIONS

The patients’ engagement and feedback using the **Skyliner** for knee skyline X-rays has assisted in **reducing the retake rate**, thus **reducing the cost**, providing **better comfort** with **reduced positioning time** while maintaining the **image quality** with **less radiation dose**.

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Click the link or QR code to view the current workflow: https://youtube.com/shorts/4rqR0dw1HM?feature=share

Click the link or QR code to view the Skyliner application: https://youtube.com/shorts/lqCGQh_T5Zs?feature=share