**Proposal of multicentred study of whether it is necessary to carry out a routine chest X-ray following chest drain removal after lung resection**

**Aim:**

1. The aim of this study was to discover whether it is safe to selectively carry out a chest X-ray
2. To identify the effectiveness of a chest X-ray post chest drain removal
3. To evaluate the financial impact for carrying out a routine chest drain in the thoracic department of the hospital
4. To formulate recommendations (algorithm) for the future management of thoracic patients, such as whether to carry out routine chest X-ray after the chest drain removal

There is no guidelines or policy of whether it is necessary to carry out a CXR following a chest drain (CD) removal within BTS. The decision to obtain a CXR after CD removal is dependent on surgeon preference but not on any specific disease process or other clinical determinant or evidence-based practice in different hospitals within the NHS. In order to standardise the procedure, some of the Thoracic surgeons and myself felt that it would be beneficial for patients as well as Thoracic surgeons to have a guideline/policy regarding the procedure. However, it would need robust evidence prior to the guideline/policy to be written.

There is growing literary evidence that shows a CXR is not routinely needed following the removal of chest drain (CD) in adult patients who have had a CD inserted following a lung resection, trauma, or spontaneous pneumothorax etc. However, there is little evidence from the UK.

The study I conducted in 2020 showed that only 1% (21 out of 2050 patients) needed chest drain reinsertion and twenty out of the 21 patients (95%) experienced some degree of respiratory difficulties (appendix1), which warranted further investigation leading to a CD reinsertion. There was only one among those 21 patients (5%) who required a CD reinsertion did not show any signs and/or symptoms but had a CD reinsertion based on CXR findings, which may or may not have been necessary.

The patients who were in the group of the study did not perform a routine CXR following a CD removal unless clinical signs and/or symptoms indicate it is necessary, such as the patient’s co-morbidity, the patient develops onset shortness of breath, desaturation, post operative recovery complications or cardiovascular instability etc. For those patients who have not been selected for CXR following the CD removal, the nursing staff will monitor them for 2 - 4 hours following the CD removal. After an Advanced Nurse Practitioner (ANP) has examined them, they will be discharged home if they are clinically stable.

During the study period, £14,166 would have been saved from the routinely carry out a CXR if the patients did not have their CXR routinely following the CD removal. The CXR savings did not include the cost of nursing staff, radiographers, porters, ward clerks and receptionists’ wages, which would add a remarkable amount of savings in addition to the figures already calculated in the study.

I have mentioned the multicentred study to some of my Thoracic colleagues who are from different trust, and the feed back are encouraging and positive. They all felt that it would provide evidence to guide our future practice and beneficial to our patients a reduction in exposure to radiation, and unnecessary interventions in asymptomatic patients

 **Appendix 1.**

**Distribution of re-evaluation: signs and symptoms, CXR findings and resulted interventions**

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Group 1: Selective CXR n = 8 (2%) | Group 2: Routine CXR n = 13 (1%) | Total patients (%)n = 21 (1%) |
| **Chest drain reinsertion** |  |  |  |
| Pneumothorax | 4 (a) (50%) | 8 (c) (61.5%) | 12 (57%) |
| Pleural effusion | 1 (12.5%) | 1 (7.6%) | 1 (5%) |
| Surgical emphysema | 2 (b) (25%) | 1(d) (7.6%) | 3 (14%) |
| Pneumothorax and surgical emphysema | 1 (12.5%) | 3 (23%) | 4 (19%) |
| **Signs and Symptoms** |  |  |  |
| Dyspnoea | 6 (75%) | 8 (61.5%) | 14 (67%) |
| Tachypnoea | 4 (25%) | 6 (46.1%) | 10 (48%) |
| Low O2 Saturation |  6 (75%) | 9 (69%) | 15 (71%) |
| Haemodynamic instability | 2 (25%) | 3 (23%) | 5 (24%) |
| Reduced pulmonary sounds | 6 (75%) | 11 (84.6%) | 17 (81%) |

a. One of the patients developed dyspnoea 5 days post chest drain removal. CXR demonstrated pneumothorax. Chest drain was reinserted.

b. One of the patients was discharged 4 hours post chest drain removal, and he was readmitted 2 days later with surgical emphysema, a chest drain was reinserted.

c. One of the patients developed dyspnoea and low O2 saturation 2 days post the chest drain removal, and one of them developed same symptoms 5 days following the chest drain removal. Both had repeated CXR after the development of their symptoms, which showed pneumothorax had worsened compared to the previous ones. Both had a chest drain reinserted.

d. The patient developed the symptoms 2 days post chest drain removal and a chest drain was reinserted.

**Reference:**

[1] Palesty JA, McKelvey AA, Dudrick SJ. The efficacy of X-ray after chest tube removal. Am J Surg 2000;179:13-16.

[2] Pacanowski JP, Waack ML, Daley BJ, Hunter KS, Clinton R, Diamond DL, Enderson BL. Is routine roentgenography needed after closed tube thoracostomy removal? J Trama 2000;48:684-688.

[3] Whitehouse MR, Patel A, Morgan JA. The necessity of routine post-thoracotomy tube chest radiographs in post-operative thoracic surgery patients. Surgeon 2009;7:79-81.

[4] Goodman MD, Huber NL, Johannigman JA, Pritts TA. Omission of routine chest X-ray after chest tube removal is safe in selected trauma patients. Am J Surg 2010;199:199-203.

[5] National Health Service. NHS The Information Standard Guide: Finding the Evidence- A key step in the information production process; 23 August 2017. 2017 <https://www.england.nhs.uk/wp-content/uploads/2017/02/tis-guide-finding-the-evidence-07nov.pdf> (06 August 2020, date last accessed).

[6] Cunningham JP, Knott EM, Gasior AC, Juang D, Snyder CL. St Peter SD, Ostlie DJ. Is routine chest radiograph necessary after chest tube removal? J Pediatr Surg 2014;49:1493-5.

[7] Bret Johnson, Michaele Rylander, Alan L Beres. Do X-ray after chest tube removal change patient management? J Pediatr Surg 2017; 52:813-815.

[8] Ellen Mcgrath, Lee Ranstrom, Debra Lajoie, Lauren McGlynn, David Mooney. Is a chest radiograph requested after removal of chest tube in children? Journal of Pediatric Health Care 2017;31:588-593.

# [9] Hart C. Doing your masters dissertation: SAGE essential study skills. London: SAGE publications Ltd, 2005:

# [10] National Cancer Institute. NIH Cancer causes and prevention; 07 March 2019. 2019 <https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation> (28 July 2020, date last accessed).

# [11] Luna Gargan, Eugenio Picana. The risk of cumulative radiation exposure in chest imaging and the advantage of bedside ultrasound. Crit Ultrasound J 2015 March 28;  doi: [10.1186/s13089-015-0020-x](https://dx.doi.org/10.1186/s13089-015-0020-x) (28 July 2020, date last accessed).