

# To Scan or Not to Scan?

*Closing the Audit Loop to Improve the Appropriateness of CTPA Requests for Suspected Pulmonary Embolism*

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A Closed-Loop Audit | Cycle 1: 4–11 Aug 2025 (n=55) | Cycle 2: 12–20 Nov 2025 (n=52)



## Background

Computed tomography pulmonary angiography (CTPA) is the first-line investigation for suspected pulmonary embolism (PE), but it carries a high radiation dose and iodinated contrast risk. Appropriate patient selection is therefore essential to minimise unnecessary imaging while ensuring timely diagnosis.

*This audit was designed to assess whether the Lincoln County Hospital Radiology department is receiving appropriate CTPA referrals, based on RCR and local guidance.*

### Audit Standards

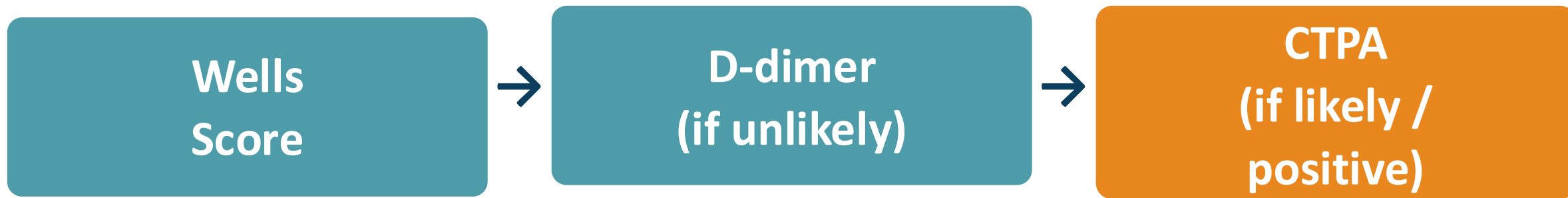
|              |                                                                                                                                                |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>STD 1</b> | 100% of referrals should include assessing pre-test probability with a PE Wells score, and use of D-dimer if the Wells score is unlikely (<4). |
| <b>STD 2</b> | 100% of referrals should follow the agreed local protocol — providing sufficient clinical detail, including age and presenting symptoms.       |

### 2-Level PE Wells Score (NICE)<sup>1</sup>

| Clinical feature                               | Points |
|------------------------------------------------|--------|
| Clinical signs/symptoms of DVT                 | 3      |
| Alternative diagnosis less likely than PE      | 3      |
| Heart rate over 100 bpm                        | 1.5    |
| Immobilisation ≥3 days / surgery in last 4 wks | 1.5    |
| Previous DVT or PE                             | 1.5    |
| Haemoptysis                                    | 1      |
| Malignancy (active, or palliative)             | 1      |

Score > 4 = PE likely • Score ≤ 4 = PE unlikely (D-dimer indicated)

### Pre-Test Assessment Pathway



*If these steps are not completed by the requesting doctor or ACP, there may be a delay in scanning.*

#### Why this audit matters

CTPA delivers a substantial radiation dose. Every inappropriate scan exposes a patient to avoidable risk without diagnostic benefit, while also consuming scanner capacity needed for patients who genuinely require urgent imaging.



## Methods

A retrospective closed-loop audit was conducted at Lincoln County Hospital using the Royal College of Radiology (RCR) “Appropriateness of Usage of CTPA in Suspected PE<sup>2</sup>” audit template as a framework, cross-referenced with local CTPA vetting criteria.

| CYCLE 1<br>4–11 Aug 2025<br>n = 55 | CYCLE 2<br>12–20 Nov 2025<br>n = 52 |
|------------------------------------|-------------------------------------|
| <b>Data recorded per referral</b>  |                                     |
| ● Referral source                  | ● Wells score documented            |
| ● D-dimer testing (if indicated)   | ● Adequacy of clinical info         |
| ● Adherence to vetting criteria    | ● CTPA outcome                      |

*Data was collected via the UV Web reporting system, cross-referenced against the RCR national audit template.*



## Intervention

Following Cycle 1, results were presented to the Radiology and Emergency Department teams. Educational posters summarising local CTPA referral requirements — Wells score, D-dimer (where appropriate), and relevant clinical information — were displayed within the Emergency Department.

### Ordering a CTPA for suspected PE?

**According to local vetting criteria, all referrals should include:**

- The patient’s clinical symptoms eg. haemoptysis, chest pain, low oxygen saturations.**
- Pre-scan probability of PE with a Well’s score, +/- D-dimer if ‘unlikely’ Well’s score.**

| 2 level PE Well’s score - NICE                                                                         |                    |        |
|--------------------------------------------------------------------------------------------------------|--------------------|--------|
| Clinical feature                                                                                       |                    | Points |
| Clinical signs and symptoms of DVT (minimum of leg swelling and pain with palpation of the lower calf) |                    | 3      |
| An alternative diagnosis is less likely than PE                                                        |                    | 3      |
| Heart rate more than 100 beats per minute                                                              |                    | 1.5    |
| Immobilisation for more than 3 days or surgery in the previous 4 weeks                                 |                    | 1.5    |
| Previous DVT/PE                                                                                        |                    | 1.5    |
| Haemoptysis                                                                                            |                    | 1      |
| Malignancy (on treatment, treated in the last 6 months, or palliative)                                 |                    | 1      |
| Clinical probability stratified score                                                                  |                    | Points |
| PE likely                                                                                              | More than 4 points |        |
| PE unlikely                                                                                            | 4 points or less   |        |

*If the above steps are not followed by the requesting doctor/ACP, there may be a delay in scanning.*

**OUTSTANDING CARE** personally DELIVERED

*Guidance was further promoted by an Emergency Medicine consultant, to increase awareness among requesting clinicians and encourage adherence to local vetting criteria.*

### Closing the Loop



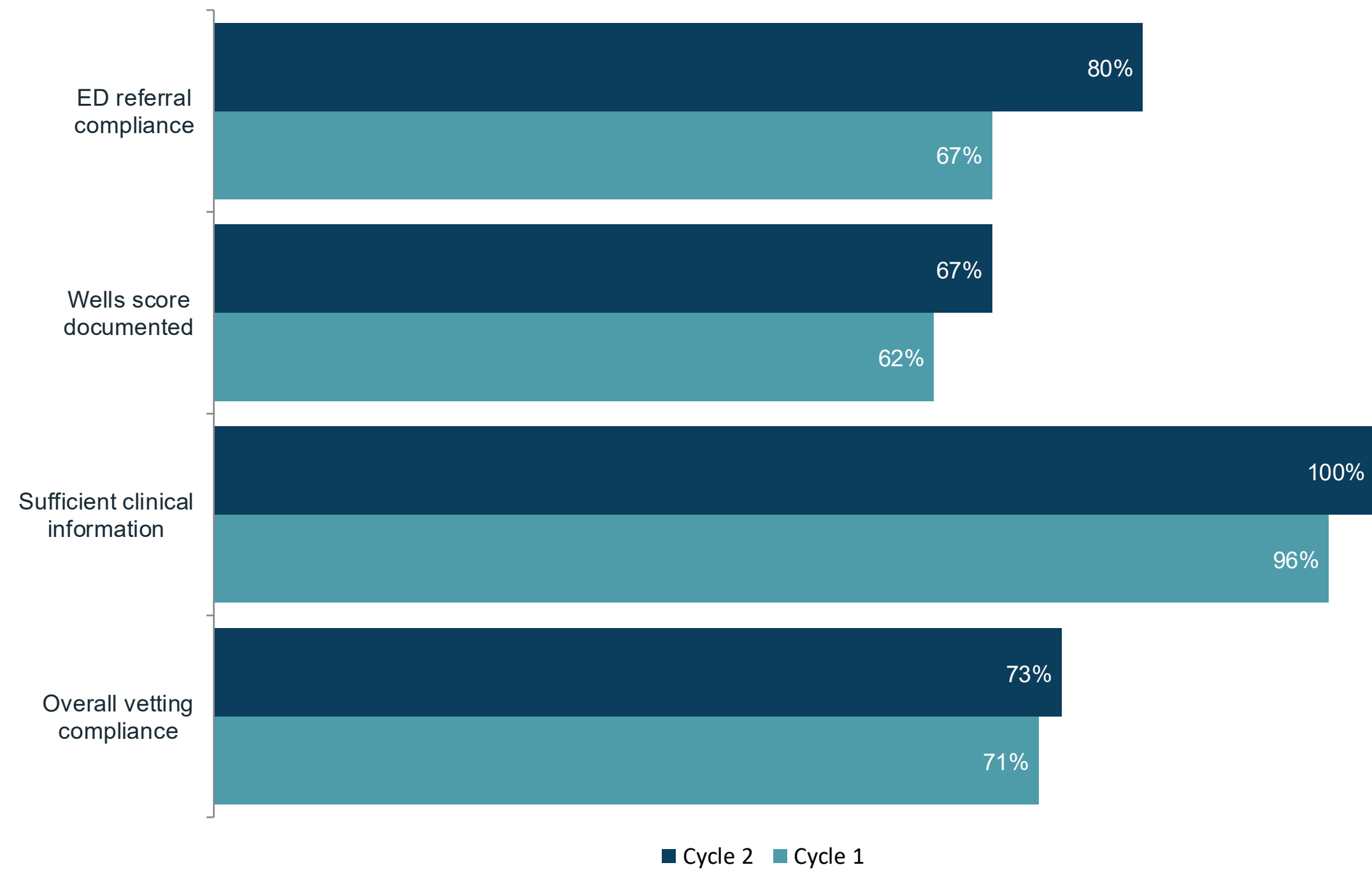
*Re-auditing after the intervention (Cycle 2) closes the loop — the defining feature of an effective quality improvement audit.*



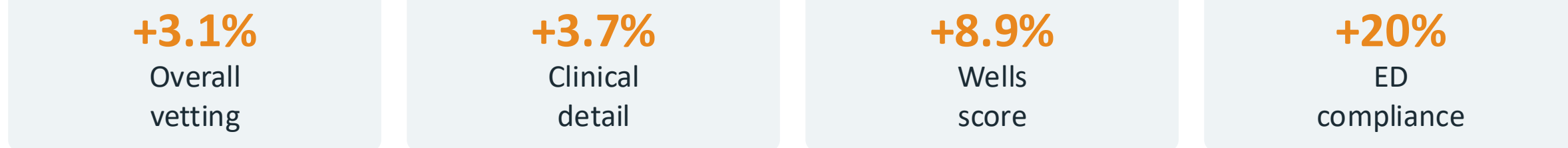
## Results



### Compliance by Standard: Cycle 1 vs Cycle 2



### Improvement vs Cycle 1



The **greatest** improvement was seen among Emergency Department referrals: in Cycle 1, 33% of A&E referrals failed to meet vetting criteria; by Cycle 2 this had fallen to just 20%.

*Of PE-positive scans, the proportion meeting vetting criteria rose from 73% to 92% — a 26% relative increase — indicating markedly more appropriate patient selection following the intervention.*

#### At a glance

52 CTPA requests reviewed in Cycle 2, up against six audit criteria — every measured standard improved on Cycle 1, with Emergency Department referrals showing the single largest gain.



## Conclusions

A simple, low-cost educational intervention led to measurable improvements in the quality and appropriateness of CTPA referrals, with the greatest improvement observed within the Emergency Department.

Although Wells score documentation remains below the desired standard, this closed-loop audit demonstrates that targeted education and reinforcement of NICE and RCR guidance can improve adherence to evidence-based referral pathways and support more appropriate use of high-radiation imaging.

*Improvements in referrers’ compliance with local protocols have been made, but could be further improved — increasing awareness in A&E has proven effective in improving clinical information included in referrals.*

## Recommendations & Actions

- Promote local guidance for the clinical information needed for vetting, and communicate this to other key referring departments, e.g. medical specialties
- Continue to reinforce awareness in the Emergency Department to sustain the gains already made
- Undertake a further re-audit cycle to confirm improvement is maintained over time

### Take-home point

*Closing the loop turns a one-off audit into lasting practice change.*

#### References

<sup>1</sup>NICE. Venous thromboembolic diseases: diagnosis, management and thrombophilia testing (NG158).

<sup>2</sup>Royal College of Radiologists. Appropriateness of Usage of CTPA Investigation of Suspected PE – National Audit Template.

### Acknowledgements

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