

## INTRODUCTION AND AIMS

The need for ongoing intravenous access, in particular central access is common place amongst many cohorts of patients in all intensive care settings. Initially at the beginning of critical illness this is achieved by central venous catheters (CVCs) usually of at least three lumens but commonly five lumens, which are inserted into either the internal jugular vein (IJV), subclavian vein (SC) or femoral vein. In our departmental guidance the dwell time of femoral lines should not exceed five days and whilst there is no specific guidance for the dwell time of IJV or SCV this rarely exceeds 10 to 14 days. This means frequent line changes which increases the potential complications of line insertion to the patient. As a patients condition improves the need for multiple lumens is less common however the need for ongoing central or peripheral venous access remains a requirement, due to common issues of difficult venous access and prolonged need for medications that require central access such as parenteral nutrition or the need for prolonged antibiotics.

If only peripheral access is required peripheral venous cannulae (PVC) can be inserted but our guidelines state this should not exceed five days. Another alternative is Midline catheters are peripheral lines that can remain in situ for up to six weeks. If central venous access is required this can be achieved by a Peripherally Inserted Central Venous Catheter (PICC). Which prior to the introduction of our Vascular Access Service were inserted in the Interventional Radiology (IR) under radiological guidance, midlines were inserted by a trust vascular access team but not by IR.

The solution to this was to train Physician Associates to insert PICC lines and Midlines under ultrasound (US) guidance at the bedside negating the need for the additional cost and risk involved in transferring a patient to IR. This started in 2016 with initially PICC lines and expanding to Midlines in 2018. Insertions have been audited on an ongoing basis since 2018.

This service evaluation project aims to evaluate the safety, efficiency and cost effectiveness of this service. This included evaluation of response time (from referral to insertion), cost saving, complication rate and dwell time of PICC and Midlines.

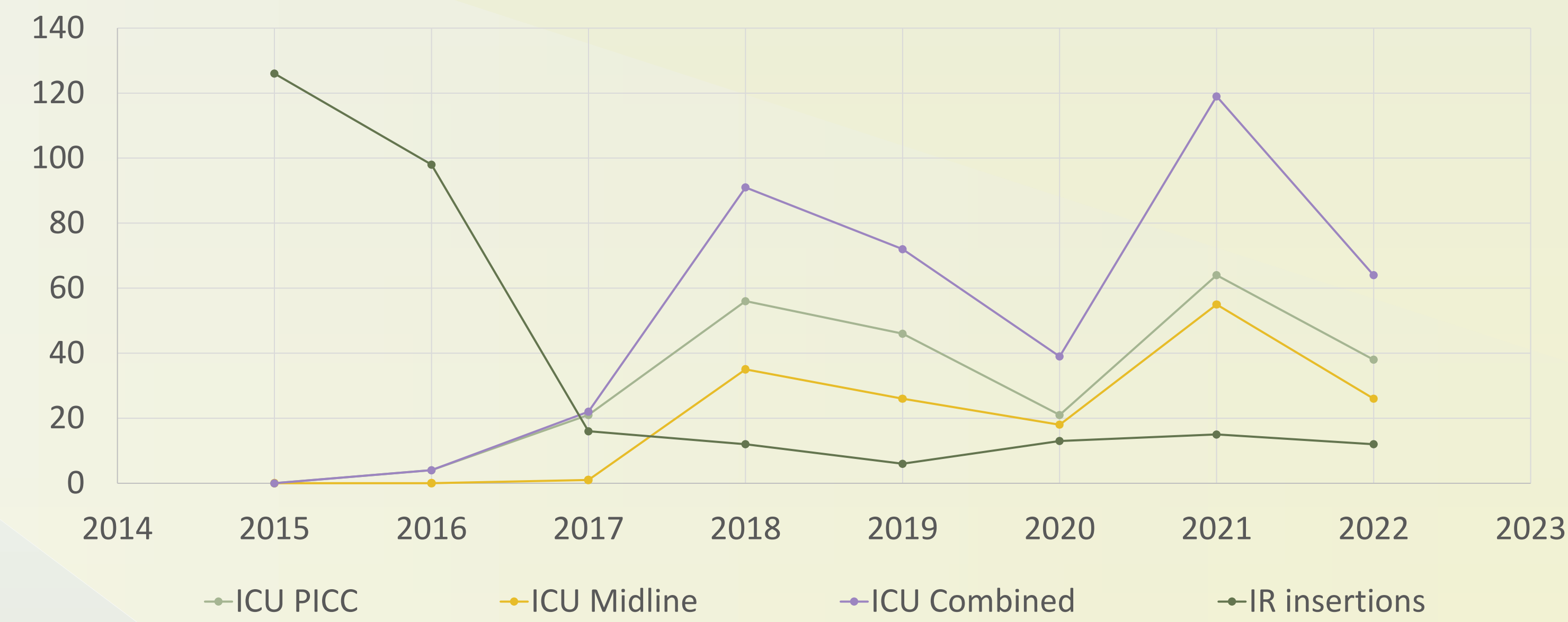
## METHODS

- Initially two then increasing to four PAs were taught to insert PICC and Midlines by practical supervised training carried out by the trust Vascular Access team. After completion of a trust approved competency document the four PAs were deemed competent to independently insert PICC and Midlines into patients in the critical care department.
- The patient population included level 2 and level 3 patients including those receiving ECMO support.
- The areas covered were four ICUs and two HDUs.
- PICC lines were inserted via US guidance at the bedside and PICC line position was confirmed with a plain Chest X-ray.
- Suitability for PICC line insertion was assessed via Trust guidance on PICC line insertion.
- PICC and midline insertions were collated in a data archive from 2016-22.
- Insertions were retrospectively audited via collecting key data points from patient records from the time period of 2018-22 when the service was fully developed.
- This data included; response time, success of insertion, thrombosis rates, catheter related blood stream infections (CLABSI), other line related complications, reason for removal and duration of insertion.
- Secondary data collection via retrospectively searching for key words "PICC", "Midline" and name of inserter from critical care IT systems was additionally carried out to ensure data was adequately captured.
- The number of insertions and response time for IR (who were the primary inserters prior to 2016) were audited as well as cost assessments for insertions of IR vs critical care lines.

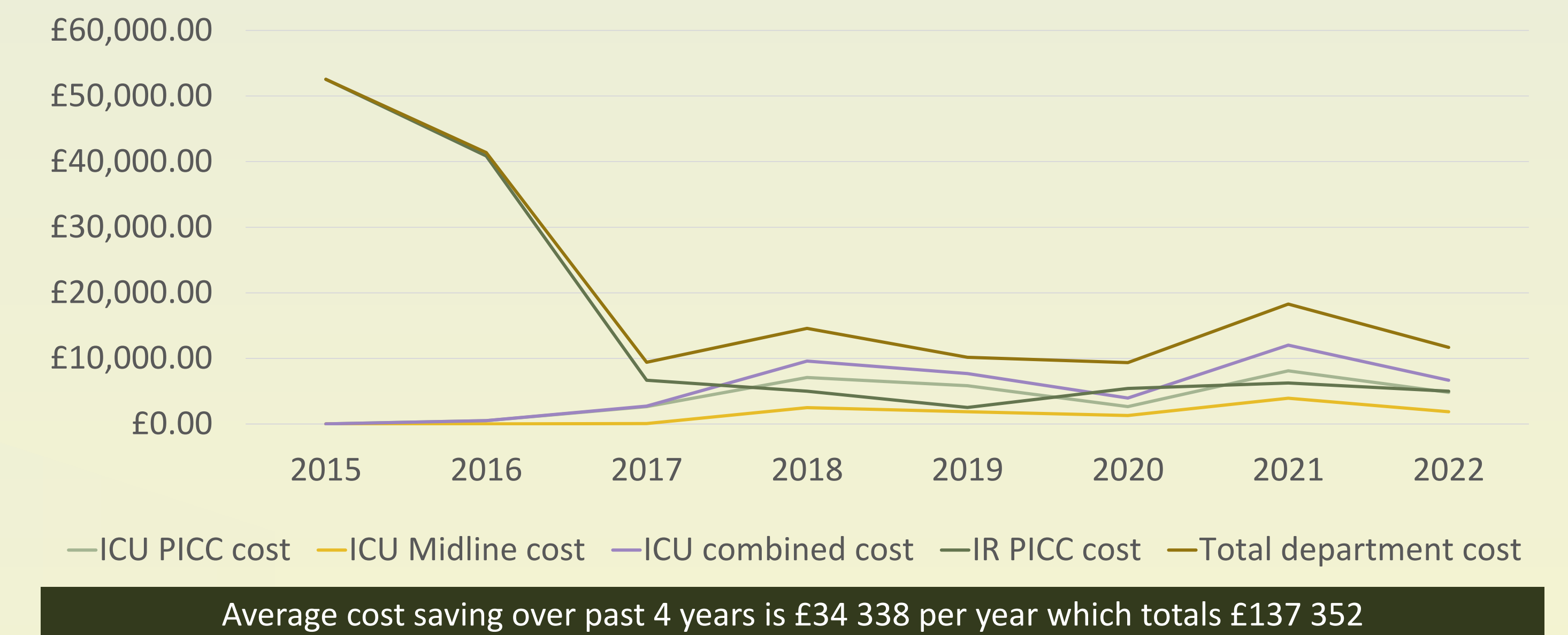
## RESULTS

- From 2018 -22 411 PICC/Midlines were inserted, 89% of insertions were audited.
- Successful insertion rate was 95%, thrombosis rates were 0-2%, CRBSI rates were 3-6%.
- Median duration of insertion was 14-28 days for PICCs and 8-29 days for midlines.
- IR insertions have been reduced by 95%, which saves the department approximately £35, 000/ year and the response time has been reduced by 50%.

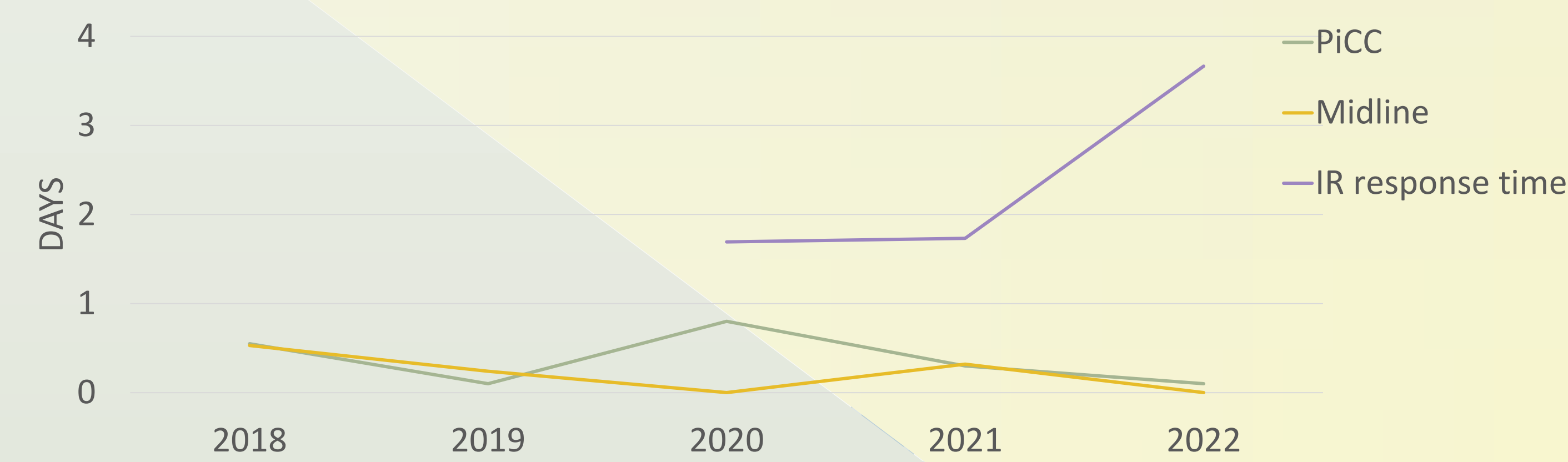
NUMBER OF PICC LINE AND MIDLINE INSERTIONS BY VASCULAR ACCESS TEAM AND IR OVER TIME



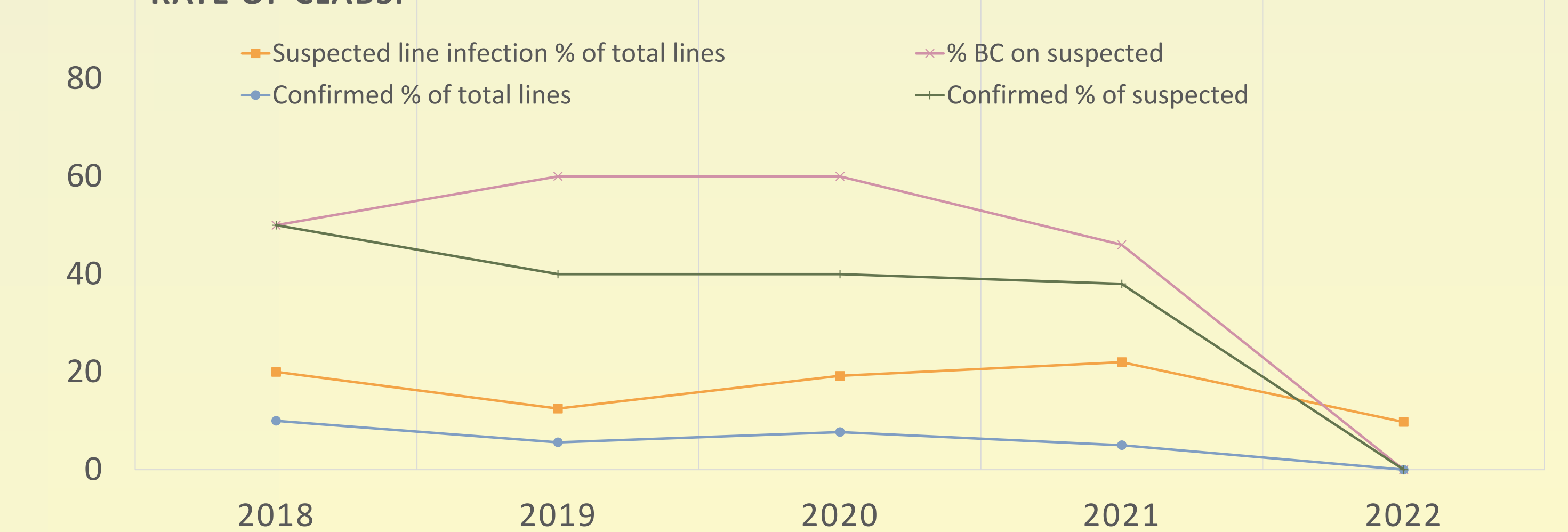
COMBINED COST TO THE DEPARTMENT OF PICC/MIDLINE OVER TIME



MEAN RESPONSE TIME IN DAYS



RATE OF CLABSI



## CONCLUSIONS

The PA led vascular access service has achieved its aims of providing a safe, efficient service at a significant cost saving to the department with complication rates comparable if not lower than in the current literature. The service has several additional benefits. The number of insertions have overall been reduced over time, one explanation for this is that referrals have been screened by the vascular access team to ensure the right line is inserted for the right patient at the right time as opposed to IR who rely on the referrer to assess suitability for a PICC. To transfer a level 3 patient to IR would require a minimum of one senior member of the nursing team and an airway trained member of the medical team as well as exposing the patient to all the potential risks involved (Droogh *et al* 2015) during a critical care transfer. By providing a bedside service the risk and cost of critical care transfers is eliminated and allows those staff that would be involved in a transfer to perform other tasks. IR guided PICC lines are not inserted under radiological guidance but by US at the bedside, therefore this service has eliminated radiation exposure to those patients who are suitable for US guided insertions. There is the additional benefit of providing a follow up service managing complications after insertion and providing information for post insertion care.

Comparing to current literature a rate of CLABSI of 8.1% of PICC line insertions (Barrigah-Benissan *et al* 2023) has been cited, the rates in this audit were 3-6%. Failed insertion rates were 5% this is lower than available literature siting rates of 12.1% (Tan *et al* 2009). Thrombosis rates are 0-2% current literature sites rates of 5-15% for inpatients (Chopra 2020). The time to insertion has been reduced by 50%, approximately £35 000 a year is saved by the department.

The limitations of this evaluation are that due to the lack of US doppler scans being requested for arm swelling or leaking lines the thrombosis rate is likely falsely low. Additionally the very low rate of paired blood cultures being performed on suspected line infections is likely to have underestimated the true CLABSI rate. Also 10-14% of patients were repatriated to their home trusts meaning further follow up was not possible. The limitations of the service are that it is only a Monday to Friday service, there is still the need for IR insertions for patients with challenging anatomy or when US guided attempts have failed, there is sometimes a capacity issue if there are no PAs available to insert the line such as during sickness or annual leave periods and there are some costs that are difficult to quantify.

It is clear that this service has been a success and provides a real benefit to the patients and staff within critical care. Following on from this evaluation we have updated the departmental guidelines around PICC and Midline insertions and are aiming to expand and improve our service. We are currently trialling other securement devices for lines and aiming to train more staff so the service can continue to expand.

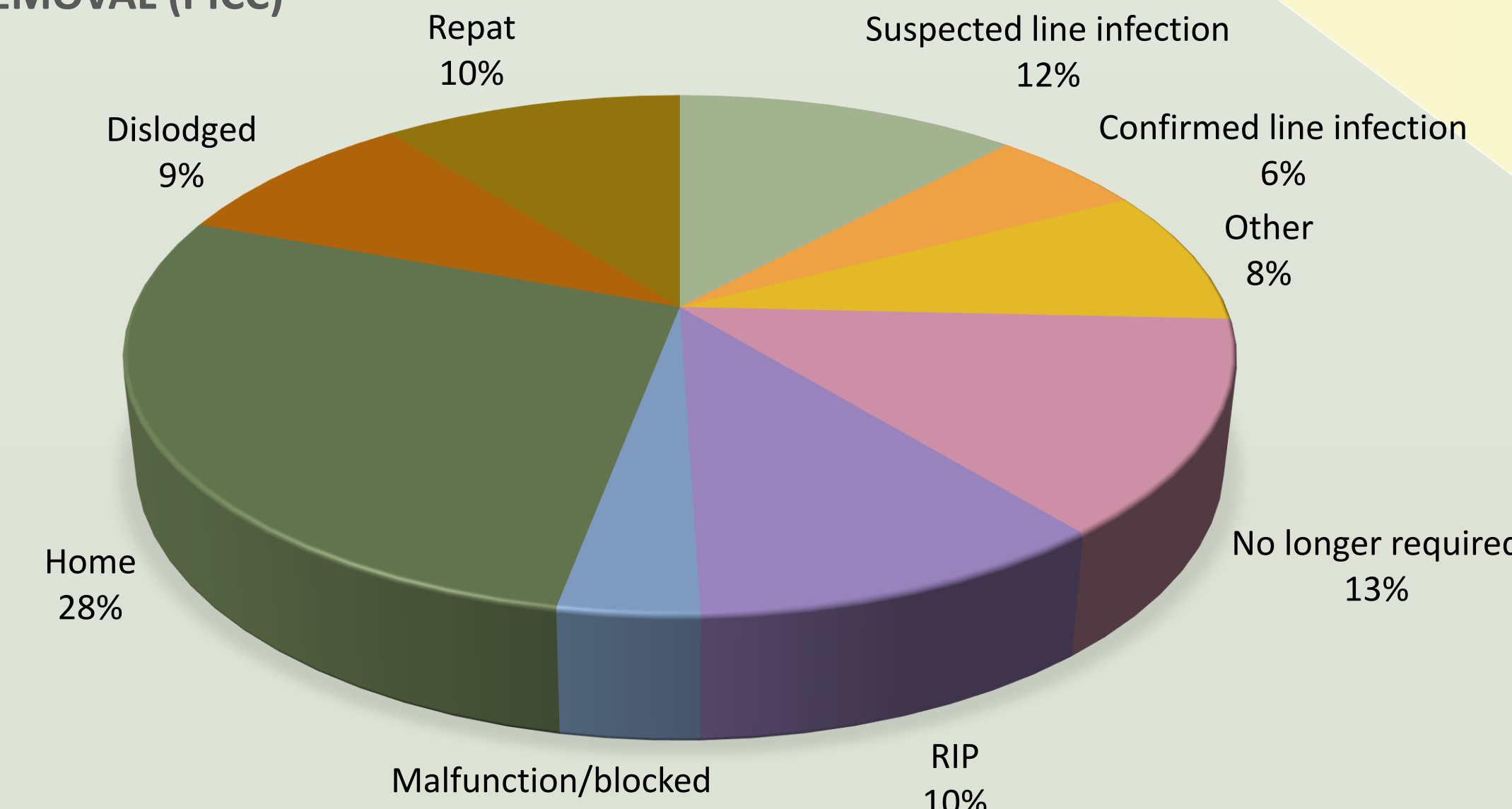
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REASON FOR REMOVAL (PICC)



REASON FOR REMOVAL (MIDLINE)

