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Do Pathways Improve Patients' Outcomes? An Evaluation of the Effectiveness of a Pathway for the Management of Breast Infections

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Abstract

Introduction: Patients presenting to the emergency department with breast infections are managed by on-call general surgeons rather than breast specialists. We have implemented a guideline-based pathway in our district general hospital to assist on-call general surgeons in managing patients appropriately. The aim of this study was to evaluate its effectiveness in improving patients' outcomes.

Materials and methods: A pathway was introduced based on NICE CKS guidance. A retrospective review of patients' medical record was carried out at three time intervals: 50 patients before the implementation of the pathway and 50 patients each twice afterwards. Approval was sought from the audit department. Outcome measures included: Use of breast ultrasound, time to ultrasound, compliance with antibiotic guidelines, rates of surgical drainage, rates of admissions. Statistical analysis of the results was performed and a p-value of <0.05 was considered statistically significant.

Results: Several statistically significant improvements were found. The proportion of patients having an ultrasound scan improved from 76% to 96%, patients requiring surgery reduced from 38% to 10%. Compliance with antibiotic therapy improved from 74% to 92%. The average wait for ultrasound from the first presentation shortened from 58 to 24 hours. The rate of inpatient admission before the pathway increased from 24% to 34% (p= 0.3), however on review of the admissions, these had appropriate indications (e.g., sepsis). The re-audit showed a sustained improvement in all outcomes.

Conclusions: The introduction of breast infection pathway sustainably reduced the rate of avoidable surgery, increased the utilisation of ultrasound facilities and improved compliance with best practice.

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Introduction

Breast infections are a common presentation to both primary and secondary care [1]. They may be classified as arising primarily from the breast tissue (i.e. mastitis) or from secondary pathology involving the skin of the breast (e.g. infected sebaceous cysts, surgical site infections, infected skin break/wound). Mastitis can be defined as lactational or non-lactational, with a worldwide prevalence of up to 20% for lactational and 5-9% for non-lactational mastitis [1,2]. As for any cause of inflammation, breast infections may develop into a frank abscess, requiring urgent drainage to prevent septicaemia [1].

The National Institute of Heath and Care Excellence (NICE) provides recommendations for breast infection management including the optimal timing and choice of antibiotics as well as information on aspiration and indication for specialist referral [3]. Despite this, there is significant variation in management across the UK as the recommendations rely on the availability of specialist radiographers, radiologists and surgeons [1]. Whilst breast abscesses were traditionally treated using standard Incision and Drainage (I&D), ultrasound-guided aspiration now forms the mainstay of intervention as a minimally invasive, effective alternative. Ultrasound also has the added advantage of differentiating between mastitis and abscess (which may not always be possible from clinical examination). However, a proportion of patients may fail to respond to aspiration and therefore still require I&D [4].

Our hospital consists of a dedicated breast team present in-hours to provide advice and management of breast infections. Patients are seen by the acute general surgery team, treated appropriately and then referred to the breast outpatient clinic. The same process is applied for patients that require admission. In 2017, this arrangement was formalised into a 'Breast pathway', a standard operating procedure used to provide homogenous care for those referred with breast infections. The aim of this retrospective study was to analyse the effect of the pathway on a number of different clinical and operational outcomes for patient referred to the acute general surgery on call.

Materials and methods

Patient population

Data was collected retrospectively at three different time points in relation to the introduction of the breast infection pathway in 2014 (Figure 1). At each of these time points, analysis was undertaken on 50 consecutive patients presenting with breast infections (total number of patients = 150). The time points were: June 2010 to July 2012 (pre-intervention group); December 2017 to December 2018 (first post-intervention group), and December 2019 to November 2020 (second post-intervention group).

Post-operative patients and those with implant-related infections were excluded from the study, otherwise all types of breast infection were included.

Data analysis

A number of different outcomes were measured- the proportion of patients receiving antibiotics, the number undergoing ultrasound/aspiration/surgery, the number of inpatient admissions and subsequent length of stay (versus ambulatory management), and whether patients were referred to the breast team. The time taken to have an ultrasound and be seen in breast clinic were also measured.

Statistical analysis

Data were analysed for statistical significance using IBM SPSS Statistics version 22 (IBM Corp., Armonk, New York, USA). The datasets were initially assessed for normality using the Shapiro-Wilk test and found to be non-parametric, therefore a Mann-Whitney U test was used to determine statistical significance. For the post-intervention groups, p values were calculated compared to the initial (i.e. pre-intervention) group. McNemar's chi-squared tests were used for categorical values.

Results

Analysis was undertaken on all 150 patients included in the study. The results are summarised in Table 1 and Figure 2. There was no statistically significant difference in the number of patients requiring admission, however, in all of these cases, the indication for admission was found to be valid i.e. sepsis requiring resuscitation and urgent intervention. There was also no significant change in the number of subsequent outpatient referrals to the breast clinic.

Antibiotic compliance

The proportion of patients receiving antibiotics (in accordance with local guidelines) improved from 74% pre-intervention to 92% in the first post-intervention group ($p<0.05$) and this was further improved to 98% in the second group ($p<0.05$).

Ultrasound outcomes

There was also sustained improvement in the number of patients receiving ultrasound scans from 76% pre-intervention to 96% and 100% in the proceeding two groups ($p<0.05$). The average time take to ultrasound did decrease from 58 hours preintervention to 33 hours in the second intervention group but this was not statistically significant. Figure 3 highlights these changes.

Number undergoing surgery

Pre-intervention, 38% of patients underwent incision and drainage of their breast infection. After the breast pathway was introduced, this number decreased to 10% in the first group and 8% in the second ($p<0.05$).

Table 1: Showing results of outcome measures before the pathway introduction and at the 2 time points after.

Outcome measure	Before pathway introduction (N=50)	1st time point after introduction (N=50)	2nd time point after introduction (N=50)
Ultrasound scan done	38 (76%)	48 (96%)*	50 (100%)*
Average time to ultrasound hrs:mins	58:04:00	24:35:00	33:27:00
Had antibiotics	37 (74%)	46 (92%)*	49 (98%)*
Underwent surgery	19 (38%)	5 (10%)*	4 (8%)*
Admitted as inpatient (>24 hr)	12 (24%)	17 (34%)	13 (26%)
Not referred to the breast clinic	9 (18%)	10 (20%)	5 (10%)

*indicates statistically significant P-values.

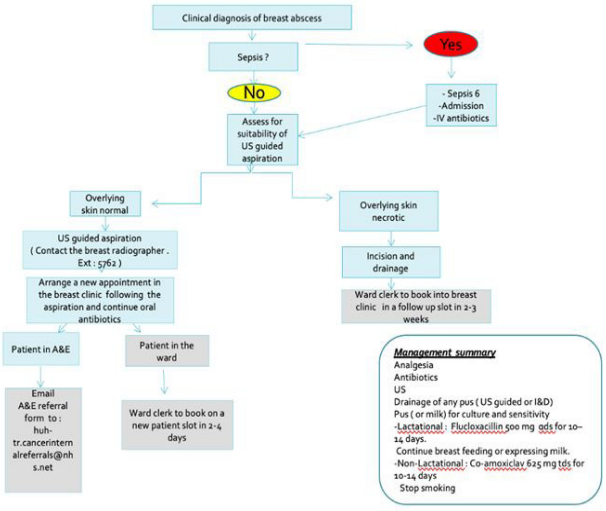

Figure 1: Breast infection pathway introduced in 2017.

US: Ultrasound.

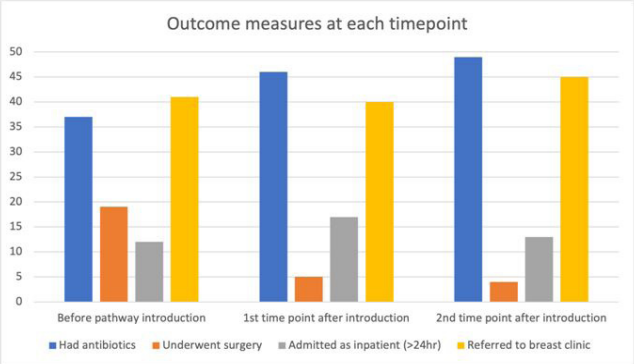

Figure 2: Demonstrating the changes in outcome measures before the introduction of the breast pathway as well as in the two time points afterwards.

Discussion

The purpose of this study was to evaluate the effect of a specifically designed breast infection pathway on the management of breast infections in a single centre. The pathway was created with the aid of pre-existing national guidelines and aimed to optimise patient care by providing a robust system for management and referral. The results have shown sustained improvement in a number of clinical outcomes over a period of 4 years since the pathway's introduction. A greater proportion of patients had ultrasound scans performed, were treated with appropriate antibiotics and avoided the need for invasive, deforming surgery.

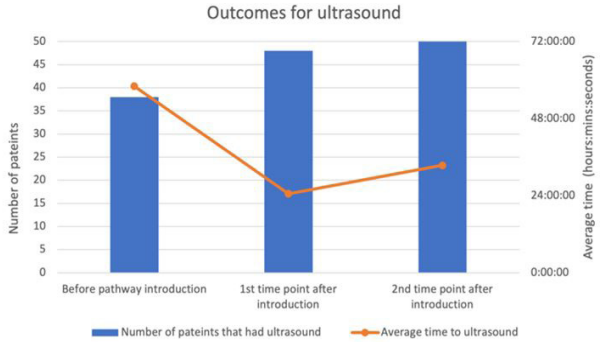

Figure 3: The impact of the breast infection pathway on the number of patients receiving ultrasound as well as the time taken to ultrasound.

It is clear from the analysis of the pre-intervention group that change was required to improve management- only 74% of patients received appropriate antibiotics and a similar proportion underwent ultrasound scanning. A high number of patients (38%) also required incision and drainage. It is of great importance to treat breast infections appropriately and in a timely fashion as complications of not doing so can include sepsis, loss of breast volume and asymmetry [5]. In addition to this, there are now greater numbers of patients that have risk factors for recurrent abscesses (e.g. obesity, diabetes and smoking)-highlighting the need for streamlined care [6,7].

The statistically significant reduction in the proportion of patients requiring surgery is an important finding as surgery can often be deforming with poor cosmesis and will lead to a scar, which may produce significant effects on a patient's quality of life [1,8]. In addition, the study also found that there was no significant change in the number of patients being referred to the breast team and those requiring admission. Retrospective analysis showed that there was a clear indication for all the patients that were admitted.

The sustained improvement shows that, once a pathway was established, there was a consistent change in practice. A difficulty often encountered in clinical practice quality improvement is creating long-term, sustainable change [9]. Teams that are able to implement successful change require good support form leadership, support from staff making the changes, staff with experience in quality improvement and, most importantly, good working relationships and teamwork [10,11]. The rapid turnover of workers in hospitals can lead to short-term changes only rather than sustainable change and education needs to be targeted and repeated to offset any negative impact. This may be achieved by utilising existing technologies such as creating proformas on the electronic patient record, induction modules

online for new staff and having 'care bundles' when requesting investigations [12-14].

Surgeons did not require formal teaching on the pathway and awareness was raised through visual cues such as having a copy of the poster in the on-call room. The process utilised pre-existing structures within the hospital as there was already a dedicated breast team consisting of surgeons, administrative staff, radiographers and radiologists. Creating such a pathway may be difficult for hospitals that do not have these resources on-site.

Limitations

One study limitation is the retrospective nature of the analysis, which means that patients may have been missed if not recorded on the database used for surgical handover. The relative rarity of breast infections compared to other general surgical conditions meant that the analysis included large time periods for each group. Whilst this is not a limitation in itself, having a higher volume centre would have provided a greater number of patients for analysis. Our focus was to analyse patients that were referred to the on-call general surgery team and did not include patients presenting to the emergency department, who were not referred. This important subgroup of patients may not have received care as per recommended guidelines and future studies may require further analysis of these patients.

Conclusion

The introduction of a breast infection pathway within our hospital has led to improvement in clinical outcomes and reduced the requirement for surgery. This has been sustained over a number of years since its inception and has utilised the pre-existing structure within the breast department.

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