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Correspondence and Communications

Response to letter commenting on predictors of complications following breast reduction surgery: A national surgical quality improvement program study of 16,812 cases

Dear Sir,

We appreciate the comments from Sugrue et al. regarding our recent publication; we are pleased that the paper has generated further interest and close evaluation.

We regret that at some point during the submission process, several variable rows for BMI were lost. Specifically, the BMI <18.5 category in Tables 3 and 4. Table 3 (BMI) should thus read:

Variable		Complication	No complication	*p*-value
BMI category	<18.5	4	210	0.001
	18.5–<25	60	2311	
	25–<30	138	5599	
	30–<35	130	4526	
	35–<40	86	2265	
	≥40	80	1403	

And Table 4 (BMI) should thus read:

Variable		Complication	No complication	*p*-value
BMI category	<18.5	7	207	<0.001
	18.5–<25	101	2270	
	25–<30	300	5437	
	30–<35	291	4365	
	35–<40	177	2174	
	≥40	158	1325	

These variables therefore contain data for the entire 16,812 cases in the cohort.

At some point during the submission process, the data for operative time in Table 3 was altered, and, as the commenters suggest, are not accurate. The correct data is:

Variable		Complication	No complication	*p*-value
Operative time	<107	115	4076	0.075
(minutes)	108–150	113	4063	
	150–199	121	4129	
	>200	149	4046	

With regards to ASA, 21 values were missing. Therefore, there was complete data for 16,791 out of 16,812 (99.9%) cases for all variables.

All subsequent statistics were performed using the data present above, and therefore the included *p*-values in the relevant tables and subsequent multivariate analysis and conclusions drawn therein are not changed.

With regards to the comment that "Variables with less than 85% completion rate were excluded from the analysis", readers will note that in the article this is followed by "This included many pre-operative laboratory values including albumin, international normalized ratio (INR), creatinine, and platelets." All included variables in our statistical method had data in greater than 85% of the cohort in NSQIP, as demonstrated.

We again thank Sugrue et al. for their diligent reading of this paper and correctly identifying these inconsistencies in the presented cohort sizes. We regret not recognizing these during the submission process.

Best regards,

Conflict of interest

No authors have any relevant conflicts of interest.
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Predictors of complications following breast reduction surgery: A national surgical quality improvement program study of 16,812 cases

Dear Sir,

Simpson et al.[1] address the important issue of patient-centered quality improvement in surgical practice. Their retrospective cohort study aims to add to our understanding of complications post-breast reduction and attempts to explore predictors for these complications.

This publication has the prospect of becoming a landmark paper due to its large sample size and broad population representation. It also has the potential to become a benchmark for consenting patients and explaining operative risks, formulating guidelines and referenced in medicolegal litigation. With this in mind, the authors have a responsibility to ensure statistics presented in this study are accurate, coherent and clinically significant.

By analyzing the data presented in Tables 1–4 of Simpson's et al. article, total study size varies from 15,395 to 17,030 patients. More specifically: 16,812 had their wounds classified (Table 1 of article), 16,791 had an ASA recorded (Table 2), operative time was recorded in 17,030 cases (Table 3), and 15,395 patients had a recorded BMI (Table 4). These major discrepancies in sample size, coupled with the fact that no percentages are provided, warrants a further assessment of data collection techniques.

We accept the authors have stated that "variables with less than 85% completion rate were excluded from the analysis". However, this is not the case. Publication of incoherent data impacts on a doctors evidence-based practice and implicates patient safety.

Reference

1. Simpson AM, Donato DP, Kwok AC, Agarwal JP. Predictors of complications following breast reduction surgery: a National Surgical Quality Improvement Program study of 16,812 cases. *J Plast Reconstr Aesthet Surg* 2019;**72**(1):43-51.

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Quantifying the burden of litigation in UK plastic surgery: A national survey☆

Dear Sir,

National spending on health litigation is increasing by more than 10% per year in the United Kingdom, with costs spiralling unchecked.[1] An online survey was created by the authors, aiming to establish the true cost and burden of litigation to UK plastic surgeons. The survey was reviewed by senior council members from the British Association of Aesthetic Plastic Surgeons (BAAPS) and the British Association of Plastic, Reconstructive and Aesthetic Surgeons (BAPRAS). A Google form was emailed to all full members via both association administrators and a further 50 invitations were sent out to fully private independent plastic surgeons.

A total of 153 survey responses were received from BAPRAS ($n = 89$, 58%), BAAPs ($n = 47$, 31%) and private independent surgeons ($n = 17$, 11%); because of membership crossover and anonymisation a response rate is not possible. Of the respondents, ninety-six (63%), held both substantive National Health Service (NHS) and private posts, whilst 31 (20%) were solely private, having previously worked in the NHS. Of the remaining respondents, 9 (6%) were full time NHS, 11 (7%) full time private having not worked in the NHS and 3 (2%) were retired from clinical work.

Fifty-seven respondents (38%) paid less than £20,000 annually in indemnity costs, while 37 (25%) paid between

☆ Part of this article has been presented at Winter BAPRAS 30th of November 2017. It has not been presented or published elsewhere.

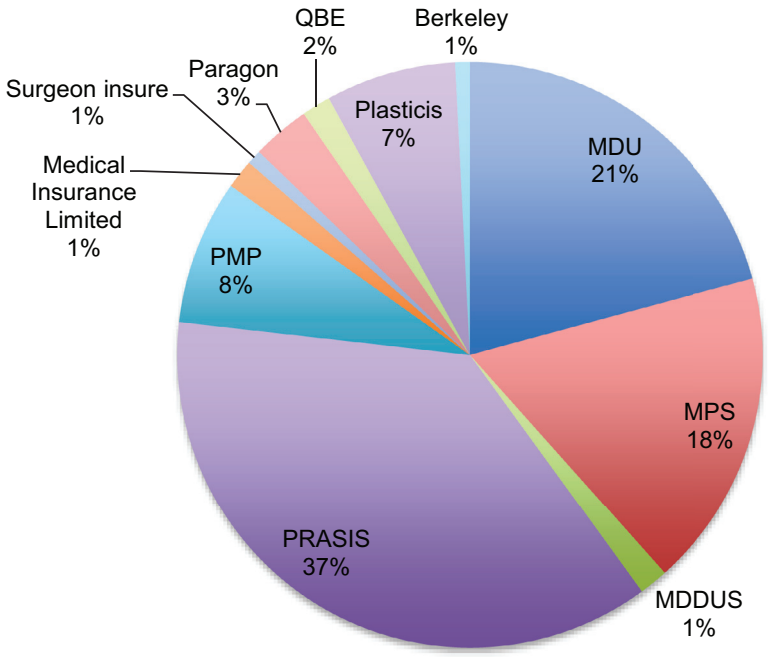

Figure 1 A pie chart demonstrating the 11 indemnity providers used by respondents.

£20,000 and £30,000. Four respondents (3%) had an excess exceeding £30,000 per case, all of whom had at least three cases brought against them in the past.

The largest proportion of plastic surgeons ($n = 47$, 32%) earned less than £100,000 per year from private practice. Twenty-two (14%) earned in excess of £400,000 per year. Of these, 14 (64%) worked only in the private sector. Most practitioners were indemnified by PRASIS ($n = 46$, 37%), the MDU ($n = 26$, 21%) or MPS ($n = 22$, 18%) (Figure 1).

For the majority of respondents ($n = 110$, 72%), indemnity costs have risen over the last five years, across indemnity providers, while for 29 (19%) they stayed the same. Eleven individuals (7%) reported a decrease in their indemnity fees over time, some of whom were purely private whilst others had a combined practice. All had either experienced claims against them, or were paying higher excesses.

Sixty-four (42%) respondents had claims against them in the private sector, of which 89% settled before court. Of those that went to court, three (38%) ruled in favour of the surgeon. Of those who had experienced claims in the private sector, only twenty-three (40%) were aware of the legal fees incurred. Remarkably, in all but two cases, the legal fee exceeded the claimant's settlement fee. For cases in the private sector, the cost of claimant settlement ranged widely. The majority were less than £10,000 ($n = 22$, 48%), or £10,000–£50,000 (insert *n* & %). There was one case where the claimant was paid £1000,000.

Respondents provided free text suggestions to improve litigation risks and costs. These comments have been divided into themes and summarised in Table 1.

Unsurprisingly, consent emerged as a critical issue as one of the major causes of litigation. Respondents called for interventions such as patient information resources,[2] procedure specific consent forms,[3] and tools to help with robust documentation.

The majority felt that the expert witnesses representing them were adequately experienced, but those acting against them were not. Notably, 28% of respondents admitted that they acted inappropriately as an expert witness themselves. 5% of respondents were performing medico-legal reports for more than 75% of their income, and two of these individuals were completely retired from clinical practice.

Plastic surgeons surveyed felt strongly that the role of the medical expert should be reviewed and subject to robust regulation. 78% of respondents felt active clinical work should be five years or less to be the limit of time to have elapsed to still being a considered an expert.

Legal fees in the UK have been described as unreasonably high and unregulated. Those who completed the survey echoed this sentiment. By far, the most frequent suggestion (25%) related to capping legal fees and claimants' costs.[4]

To date, no comprehensive data exist detailing the burden of litigation to UK plastic surgeons. This survey highlights the depth of concern currently seen amongst UK plastic surgeons. It is clear that there is a problem, and that debate and reform of this subject is well overdue. We are reaching a crisis point where litigation is becoming unaffordable, to individuals and institutions. It is essential, that we quantify and minimise litigation costs in the UK, as has occurred in many other high-income countries already.[5] Turning a high litigation, high indemnity society to a low cost, low risk, low indemnity one starts with transparent, reflective practice, and reflection on other systems' successes.

Table 1 A summary of common themes from respondents with regard to improvements that could be made to the incidence and risk of litigation in plastic surgery in the UK.

Focus on consent (12%)
- Having nationally agreed guidelines on consent forms
- Photos to aid consent process. Better communication skills.
- BAPRAS should produce procedure specific consent forms and educational videos for patients, which all members can link on their websites

Patient education resources (5%)
- Pictorial examples on potential complications, cooling off period extended to 2 months, no cosmetic surgery for patients under age 20.
- Improved information leaflets provided by BAAPS/BAPRAS, best practice guidelines e.g. for VTE prevention, implant use.
- It would be helpful to have a network of 'super experts' who can offer further help to patients who are unhappy or dissatisfied

Surgeon collaboration and training (11%)
- Better training for surgeons.
- Involve colleagues in the decision making process regarding either complex primary surgery or revision surgery
- Have a BAAPS expert body to support the members in illogical claims
- A risk lowering set of courses on communication and managing risk.

National database of litigation and PROMS (6%)
- Data! Surgical performance ought to be reviewed on a monthly basis. Stand-alone surgeons often have neither the volume of cases nor the requirement to keep data regarding their practice, so indemnifiers have no sense of the quality of the service provided. There HAS to be a national database of cosmetic surgery, with complications and PROMS. Only with that can the indemnifiers produce a truly bespoke policy

Regulation of expert witnesses (14%)
- Clinicians who have retired cannot be considered 'experts' as they cannot substantiate their claim, neither in their appraisals or revalidation
- Make it impossible for the expert to carry out the revision surgery
- If their entire income is from expert witness statements they potentially have a conflict of interest
- Obtain information from other countries, to regulate expert witnesses better

Capping of legal fees and claimants' cost (25%)
- A cap on claimants costs and fixed ceiling
- A clamp down on 'no win no fee, legal practices'
- Successful defence costs are not recoverable – it needs changing
- The situation is straightforward. Most claims, in my experience, are of small value to the claimant, but the claimants' legal costs are out of control and far beyond any monies that defence costs. A cap on claimants' legal fees needs to be introduced

Indemnity providers (13%)
- Total transparency from the insurers by publishing the annual number and cost of medical litigation
- My indemnity provider considers every revision/unhappy patient as a 'potential claim' and uses that to justify increasing the premium (though I have not had any claims in seven years of practice). We should ask for stopping this questionable practice and ask for more transparency in setting premiums
- Defence unions should offer reduced premiums on a no-claims basis
- If claims are found to be unsubstantiated and are successfully defended then it should not increase indemnity costs… defendants should be able to recover costs from the claimant or from the solicitor
- Free impartial legal advice with indemnity, with no penalties for asking the question
- Allow plastic surgeons to separately indemnify each part of their practice – NHS, Cosmetic surgery, Non-surgical aesthetic and medico legal. Most providers are pro-actively hindering this. The principle should be that changing your medical indemnity should be as easy as changing your house insurance
- *Other/Miscellaneous (14%)*
- Educate the courts! Penalise low volume operators and poor training
- Public awareness. Counterclaim. Challenge the viewpoint taken by the defence or claimant. Use negotiating agencies
- When you have a suboptimal cosmetic result, do not revise "at request of patient" and take early legal advice. Document excessively
- Charge other specialties that do "plastic surgery" procedures the same amount and therefore reduce overall indemnity

We need to create a balance between: fairly compensating patients, creating a viable working environment, and managing financial and clinical risk going forward. At present these issues are being ignored. More attention and work in this area is urgently needed.

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Conflict of interest

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References

1. NHS Litigation Authority. Annual reports and accounts 2015/16. Available at https://www.gov.uk/government/publications.
2. Purcarea VL, Cazac C. Solutions for reducing lawsuits in orthopedic surgery by using psychology and IT technology. *J Med Life* 2015;**8**:47–51.
3. Cooper L, Mosahebi A, Nduka C. Developing procedure-specific consent forms in plastic surgery: lessons learnt. *J Plast Reconstr Aesthet Surg* 2017;**70**(3):428–30.
4. Torjesen I. Government will cap legal fees in clinical negligence cases. *BMJ* 2015;**350**:h3561.
5. Raper SE, Rose D. Taking the initiative: risk-reduction strategies and decreased malpractice costs. *J Am Coll Surg* 2017;**225**(5):612–21.

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Experience with sternal plating and local flap reconstruction in patients with sternal dehisence☆

Dear Sir,

Malunion or nonunion of the sternum requires plating, and often, soft tissue coverage, typically provided by the pectoralis muscle(s).[1-2] However, there is only one report examining outcomes for patients undergoing sternal plating with flap reconstruction.[3] In this study, we report on our experience with long-term follow-up at a tertiary care center providing soft tissue coverage with pectoralis flaps after sternal plating.

A retrospective chart was conducted for patients who underwent sternal plating with reconstruction by the senior author from 2010–2013. Charts were reviewed for surgical indication, reconstruction and outcomes. Chronic pain was considered if a patient had follow-up for more than 90 days and there were subjective complaints of pain.

Twenty patients, nineteen males and one female, fit inclusion criteria. Patient characteristics, indications for plating and peri-operative complications can be found in Table 1. Twelve patients underwent a unilateral flap and eight bilateral. Four patients required re-operation, due to sternal non-union (two), exposure of plating (one) and hematoma (one). For the two patients who required re-operation due to sternal non-union, they occurred sixteen and nine months post-operatively. One had undergone unilateral pectoralis flap and one bilateral. In both, the left flap was able to be elevated and re-advanced to provide ample soft tissue coverage. The patient who experienced exposure of the plating system had numerous co-morbidities and thus, during revisionary surgery, a vacuum device was placed as opposed to more aggressive reconstruction. One patient underwent a second CABG sixteen months after plating and the plate was intact and easily removed. None of these patients required any additional sternal surgeries.

When sternal soft tissue coverage is required, a unilateral or bilateral pectoralis major muscle flap is typically utilized.[1] The prior use of an LIMA graft does not preclude this option as the blood supply comes from the thoracoacromial artery. Our approach begins with appropriate debridement. Pectoralis muscle attachments to the sternum are then excised staying on top of the rib fascia, laterally on top of the pectoralis minor and caudally on top

☆ The authors have no disclosures to report.

Table 1 Patient and flap characteristics.

Characteristic	Number of patients
Sex	
Male	19
Female	1
Age (mean, range)	62.6 (41–86)
BMI at time of sternal reconstruction (mean, range)	34.7 (24.8–60.3)
Albumin at time of sternal reconstruction (mean, range)	3.8 (2.4–4.7)
Co-morbidities	
Diabetes	
Yes	8
No	12
COPD	
Yes	5
No	15
Smoker at time of sternal reconstruction	
Yes	6
No	14
Follow-up (mean, range)	864 days (5–2138 days)
Indication for plating	
Non-union	11
Fracture/Instability	3
Prophylactic	2
Wound dehiscence	3
Inability to approximate sternum at primary surgery	1
Donor vessel	
LIMA	9
RIMA	0
BIMA	1
N/A	6
Unknown	4
Infection after primary sternal surgery	
Yes	3
No	16
Unknown	1
Flap	
Unilateral pectoralis flap	12
Bilateral pectoralis flap	8
Peri-operative complications	
Transfusion	
Yes	2
No	18
Prolonged ventilation requirement	
Yes	2
No	18
Complications	
Infection requiring intravenous antibiotics	2
Need for re-operation	4
Chronic pain with 90 day follow-up	
Yes	5
No	10
Too short follow-up	5

of the anterior rectus sheath, elevating the anterior rectus sheath as one piece with the pectoralis myocutaneous flap. Unilateral or bilateral determination is based on size of defect and ease of closure. After plating, the pectoralis flaps are sutured across the midline to each other, until the plates are completely covered. Drains are placed and multi-layered closure is performed, followed by placement of an ioban, which is removed 48 h after surgery.

There is a paucity of data on outcomes and post-operative complications when utilizing pectoralis flaps in the context of sternal plating. Literature search revealed only one study reporting on outcomes for these patients, a case series of 74 patients.[3] However, median and average follow-up was not reported. These patients had a high rate of seromas (24%), almost half of which occurred after drain removal, likely due to the extensive undermining necessary. In our series, there were no seromas requiring any intervention. However, we act conservatively with drain removal, only removing drains when the output is less than 30cc for two consecutive days. The aforementioned study reported three (4%) dehisences and three (4%) hematomas requiring re-operation but not re-operations to fix the plating system.[3] In our series, four patients required reoperation for hematoma (one, 5%), plate exposure (one, 5%) and sternal non-union (two, 10%). However, our mean follow-up was 864 days, and this cannot be compared to a study with unknown follow-up.[3]

A common complication in this patient population, in up to 51% of patients, is chronic pain.[4] In our series, out of the fifteen patients with at least 90 days follow-up, five (33.3%) had subjective chronic pain. These patients were referred to and managed by pain management specialists. The study from Hugo et al. did not evaluate chronic pain as part of their study, it was just mentioned that no patient complained of chronic pain.[3] However, follow-up was not reported and this is a sequela that can often present years after surgery.

We report on our long-term outcomes associated with sternal plating with flap coverage, a topic with minimal reporting. This study is not without limitations. It is a retrospective, single-center, single-surgeon review. However, our results demonstrate that when soft tissue coverage is required in the context of sternal plating, the pectoralis muscle provides durable soft tissue coverage. We consider this our standard of care when planning reconstruction for this complex patient population. More well-done, large studies are required to report on the long-term outcomes of these patients in order to determine the most effective way to provide long-term soft tissue coverage and a durable sternal repair.

References

1. Jurkiewicz MJ, Bostwick J 3rd, Hester TR, Bishop JB, Craver J. Infected median sternotomy wound. Successful treatment by muscle flaps. *Ann Surg* 1980;**191**(6):738–44.
2. Nahai F, Morales L Jr, Bone DK, Bostwick J 3rd. Pectoralis major muscle turnover flaps for closure of the infected sternotomy wound with preservation of form and function. *Plast Reconstr Surg* 1982;**70**(4):471–4.
3. Hugo NE, Sultan MR, Ascherman JA, et al. Single-stage management of 74 consecutive sternal wound complications with pectoralis major myocutaneous advancement flaps. *Plast Reconstr Surg* 1994;**93**(7):1433–41.
4. Ringelman PR, Vander Kolk CA, Cameron D, Baumgartner WA, Manson PN. Long-term results of flap reconstruction in median sternotomy wound infections. *Plast Reconstr Surg* 1994;**93**(6):1208–14 discussion 1215-6.

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Novel avenues in tissue Expansion: Promises and concerns

Dear Sir,

The medical community is witnessing leaps and bounds as plastic surgeons continue to innovate and advance our practice. The growing use of simulation, virtual and augmented reality technologies are redefining post-graduate education in plastic surgery[1]; numerous innovations such as cryolipolysis and radio-frequency body tightening have enhanced our ability to cater to the diverse aesthetic needs of our patients. However, and while the excitement behind these innovations continues to fuel their adoption, amelioration and further innovation, we must keep patient safety at the forefront of our concerns and continue pushing boundaries in research for more evidence-based safety recommendations.

Two-stage alloplastic breast reconstructions are widely considered as the standard of care in breast reconstruction today. An exciting alternative to traditional saline-based expanders has emerged recently on the market in the United States and Australia; the AeroForm Tissue Expansion

System© features remote-controlled, needle-free, carbon-dioxide-based (CO_2-based) expansions designed specifically for low-volume inflations. A daily limit of 30 cc is pre-set for patients opting to perform their expansions from the comfort of their homes, though this limit may be over-ridden for in-office expansions by treating plastic surgeons[2].

Several notable advantages resonate with this approach: the possibility for patient-based expansions serves to empower patients by increasing their involvement in their reconstructive journey, while also circumventing the need for expensive, time-consuming office visits. The median time to complete the process of expansion, as well as the latency until the second-stage operation were both significantly reduced with the CO_2-based expanders in comparison to traditional saline-based controls (21.0 vs. 46.0 days, and 108.5 vs. 136.5 days, respectively, $p < 0.0001$)[3,4]. The needle-free design is a notable asset for decreasing pain and discomfort associated with repeated needle injections; it also serves to eliminate the risk of inadvertent expander puncturing and reduces the predisposition to infections in the setting of chemotherapy-induced leukopenia.

Several concerns regarding air expanders remain however owing to a paucity of in-vivo studies on this topic. The inability to deflate CO_2-based expanders represents a legitimate concern with regards to underlying skin flap perfusion compromise and pain, especially in situations of unwanted, inadvertent or spontaneous expansions. Furthermore, this inability to deflate may present as a therapeutic barrier for both oncologists and the treating plastic surgeons in the context of adjuvant radiation therapy requiring expander deflation. The effect of increased expander volume during ascent to high altitudes on underlying skin flap perfusion (even inside pressurized cabins) warrants further in-vivo evaluation. Randomized controlled studies[3] have reported a 10% rate of loss in communication between the expander and the remote control, culminating eventually in additional surgeries for their replacement. While this specific complication has not yet been observed in the updated version of the expander (v2.5), the risk of loss in connection or interference with other electronic devices (such as pacemakers and defibrillators) may still persist. The extent and safety of passive air permeation from the expander requires further insight given the high solubility of CO_2. Although electronic circuits and metallic CO_2 reservoirs resisted ex-vivo radiation studies[5], film dosimetry demonstrated beam attenuation in the shadow of the metallic reservoir[6]. Should this finding be concerning from an oncologic point of view, or should CO_2 reservoirs behave differently in an in-vivo setting when exposed to 50–60 Gy radiation doses is yet to be determined. Finally, the expanders' higher associated costs remain as barriers for their adoption among both patients and health-care systems today.

It remains unclear whether CO_2-based expanders will be the future of tissue expansion for both breast and non-breast tissue alike. It is without a doubt that these expanders have demonstrated great potential for adoption thus far in the United States and Australia. We believe that this technology can provide significant clinical benefits and satisfaction for our patients. Nonetheless, future endeavors are encouraged to further evaluate its safety profile with regards to radiation exposures and CO_2 leaks, and to develop an elegant solution to expander deflation when clinically indicated. We recommend the choice of expansion system at present to be on a patient-by-patient basis, taking into account surgeon's preferences, and with cautious consideration of our current understanding of both the benefits and limitations of this model, in today's era of technologically-driven, evidence-based medical practice.

Conflicts of interest

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Author contributions

All authors were involved in manuscript write up and revisions.

References

1. Kazan R, Cyr S, Hemmerling TM, Lin SJ, Gilardino MS. The evolution of surgical simulation: the current state and future avenues for plastic surgery education. *Plast Reconstr Surg* 2017;**139**(2):533e–543e.
2. Morrison KA, Ascherman BM, Ascherman JA. Evolving approaches to tissue expander design and application. *Plast Reconstr Surg* 2017;**140**(5S Advances in Breast Reconstruction):23s–29s.
3. Ascherman JA, Zeidler K, Morrison KA, et al. Carbon dioxide-based versus saline tissue expansion for breast reconstruction: results of the XPAND prospective, randomized clinical trial. *Plast Reconstr Surg* 2016;**138**(6):1161–70.
4. Ascherman JA, Zeidler KR, Jacoby A, et al. Carbon dioxide versus saline tissue expanders: does it matter. *Plast Reconstr Surg* 2016;**137**(1):31–5.
5. Rembert JL, Heitz R, Hoffman A. Radiation testing of the AeroForm CO_2-based breast tissue expander implant. *Radiat Oncol* 2013;**8**:235.
6. Moni J, Saleeby J, Bannon E, Lo YC, Fitzgerald TJ. Dosimetric impact of the AeroForm tissue expander in postmastectomy radiation therapy: an ex vivo analysis. *Pract Radiat Oncol* 2015;**5**(1):e1–8.

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Carbapenemase-producing *Enterobacteriales* in plastic and reconstructive surgery departments in Portugal: Should we be worried?☆

Dear Sir,

Carbapenemase-producing *Enterobacteriales* (CPE) have emerged as a significant global public health problem that places patients at risk of potentially untreatable infection, being carbapenemase-producing *K. pneumoniae (KPC)* the most common.[1,2] *Enterobacteriales* (e.g. *Escherichia coli, Klebsiella pneumoniae, Enterobacter cloacae* and *Proteus species)* are the largest family of gram-negative bacteria causing human infection.[1] *Enterobacteriales*colonize the normal human gastrointestinal tract, generally without causing disease. However, they can also cause common infections, including urinary tract, abdominal and bloodstream infections.[1] CPE are resistant to carbapenems, a class of 'last resort' antibiotics for treating serious infections. This dramatically limits treatment options, that typically include colistin, tigecycline, ceftazidime/avibactam and one or more aminoglycoside.[1,3] The carbapenem-hydrolyzing beta-lactamase are classified on the basis of their amino acid homology; Classes A, B, and D are of greatest clinical importance. The clinically most important of the Class A carbapenemases is the *Klebsiella pneumoniae* carbapenemase (KPC) group, which has been implicated in several outbreaks. Class B beta-lactamases are known as the metallo-beta-lactamases (MBLs), which are named for their dependence upon zinc for efficient hydrolysis of beta-lactams. The New Delhi metallo-beta-lactamase (NDM-1) is an important emerging carbapenemase in this group. Class D beta-lactamases are referred to as OXA-type enzymes because of their preferential ability to hydrolyze oxacillin (rather than penicillin).[4] The first clinical report of KPC in Portugal dates back to 2009 and it was identified at a pediatric department.[2] There have been some outbreaks at our hospital that made us question about our department's reality.

We have characterized clinical information on CPE in a Plastic and Reconstructive Surgery Department, collecting data since 2016. As seen in Table 1, in these two years we had 8 patients with CPE: 5 in our burn unit and 3 admitted for surgery. Carbapenemase enzymes identified in clinical isolates included NDM, KPC, VIM and OXA-48-like, being KPC the most common ($n=5$). All patients had more than three risk factors for CPE, as seen in Table 2. One patient, diagnosed with trochanteric pressure sore admitted for reconstruction, was colonized and did not require specific treatment. Seven had active infection: 1, from the burn unit, developed urosepsis due to CPE resulting in death; 4, from the burn unit, had skin graft infection, resulting in loss and delay in graft healing; 1 developed cervical surgical wound infection after cervical dissection due to oral squamous cell carcinoma, needing surgical debridement and closure with local flaps; and another was diagnosed with femur osteomyelitis identified in bone culture after performing bursectomy, ostectomy and coverage with flap for ischiatic pressure sore reconstruction, needing several months of IV antibiotherapy.

Our patients were treated in cooperation with infectologists. These infections were a significant clinical challenge. We observed delayed effective treatment, therapy failure and longer hospitalization. Our epidemiological investigation is limited by the retrospective data collection and the reliance on paper-based medical records. Thus, Plastic and Reconstructive Surgery Departments should be in alert and prepared to identify and treat these organisms early. We should be able to identify patients at high risk of colonization or infection and screen for CPE upon hospital admission in order to place them on contact precautions during their hospitalization and provide proper treatment.

☆ The work was presented, in part, as an oral communication, in the XLVIII Annual Meeting of the Portuguese Society of Plastic, Reconstructive and Aesthetic Surgery.

Table 1 Characteristics of patients with carbapenemase-producing *Enterobacteriaceae* (CPE).

	Age (y)	Gender	Diagnosis	Origin before hospital admission	Destination at hospital admission	Hospital stay (days)	Surgery	Anatomical site of isolation	ECR isolation	Infection/ colonization	Antibiotic therapy within the last 90 days before CPE isolation	Antibiotic therapy after CPE isolation	Death due to CPE infection
Patient 1	88	Female	Burn	Other national hospital	Burn Unit	60	Debridement and skin graft	Burn wound	OXA-48	Infection	Meropenem, ertapenem, cephazolin	Amicacin Levofloxacin	No
Patient 2	46	Male	Burn	International hospital[a]	Burn Unit	78	Debridement and skin graft	Burn wound	VIM	Infection	Meropenem Vancomicin	Gentamicin Tigeciclin	No
Patient 3	35	Female	Burn	Other national hospital	Burn Unit	61	Debridement and skin graft	Urine	KPC	Infection	Gentamicin, ciprofloxacin	Colistin	Yes
Patient 4	30	Female	Burn	International hospital[a]	Burn Unit	46	Debridement and skin graft	Burn wound	NDM	Infection	Metronidazolm ceftriaxone, axtreonam, imipenem	Colistin	No
Patient 5	41	Male	Burn	Other national hospital	Burn Unit	25	Debridement and skin graft	Burn wound	KPC	Infection	Meropenem Vancomicin	Colistin	No
Patient 6	72	Male	Oral squamous cell carcinoma	Home	Plastic Surgery Department	85	Tumour removal; parcial glossectomy; marginal mandibulectomy; plasty with local flap; cervical dissection	Cervical wound	KPC	Infection	Amoxicilin + clavulanic acid	Amicacin Gentamicin	No
Patient 7	53	Male	Trochanteric pressure sore	Home	Infectious diseases Department	16	Bursectomy; plasty with posterior tight flap	Rectal	KPC	Colonization	None	None	No
Patient 8	62	Male	Ischiatic pressure sore	Home	Plastic Surgery Department	280	Bursectomy; plasty with posterior tight flap	Bone	KPC	Infection	Meropenem; vancomicin	Ceftazidima + avibactam; colistin; tigeciclin	No

[a] Angola, Africa.

Table 2 Risk factors for CPE. [1]

Risck factors	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Patient 7	Patient 8	*n*
Long Hospitalisation	x	x	x	x	-	x	-	x	6
Hospitalised or surgery overseas[a]		x		x	-	-	-	-	2
Multiple or recent exposures to different antibiotic agents	x	x	x	x	x	x	-	x	7
Diabetes mellitus	x	-	-	-	-	x	-	-	2
Mechanical ventilation		x	x	-	x	-	-	-	3
Admitted to intensive care unit	x	x	x	x	x	-	-	-	5
Indwelling medical device (central venous catheter, urinary catheter or biliary catheter)	x	x	x	x	x	x	x	X	8
Recipients of an organ or stem cell transplant	-	-	-	-	-	-	-	-	0

[a] Two patients admitted on our burn unit were transferred from Angola, Africa.

Conflict of interest

No conflicts of interest or founding sources to disclose for this study for any of the authors listed.

References

1. Richards M, Cruickshank M, Cheng A, et al. Recommendations for the control of carbapenemase-producing Enterobacteriaceae (CPE): a guide for acute care health facilities: Australian Commission on Safety and Quality in Health Care. *Infect Dis Heal* 2017;**22**(4):159–86. doi:10.1016/j.idh.2017.09.001.
2. Pires D, Zagalo A, Santos C, et al. Evolving epidemiology of carbapenemase-producing Enterobacteriaceae in Portugal: 2012 retrospective cohort at a tertiary hospital in Lisbon. *J Hosp Infect* 2016;**92**(1):82–5. doi:10.1016/j.jhin.2015.11.006.
3. Meletis G. Carbapenem resistance: overview of the problem and future perspectives. *Ther Adv Infect Dis* 2016;**3**(1):15–21. doi:10.1177/2049936115621709.
4. John Quale D.S. Overview of carbapenemase-producing gram-negative bacilli. *UpToDate*. 2018. https://www.uptodate.com/contents/overview-of-carbapenemase-producing-gram-negative-bacilli?search=Overview-ofcarbapenemase-producing-gram-negativebacilli&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1.

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The historical relationship between art and plastic surgery: Is this relationship still relevant to the modern plastic surgeon?

Dear Sir,

Anyone familiar with plastic surgery would be hard pressed to ignore the comparisons that are frequently made between art and this speciality. Yet, these associations are more substantiated than you may think and, indeed, this speciality's conception was intimately related to the practice of artistic pursuits.

Plastic surgery made a substantial move towards the modern speciality that we know today with the exploits of Harold Gillies during the First World War, throughout which he worked alongside several talented artists and sculptors.[1] The most famous of these was Henry Tonks, a doctor-turned-artist who went on to become a Slade Professor of Fine Art. He not only drew surgical diagrams for Gillies, but also completed a collection of graphic and emotive pastel portraits of his patients.[1] It is also important to note that Gillies himself was a keen artist and spent much of his free time painting. Furthermore, when Gillies published his magnum opus in 1957, *The Principles and Art of Plastic Surgery*, it is telling that he employed the use of the word 'art' in its title.

During the Second World War, Gillies' protégé Archibald McIndoe also enlisted the aid of a medical artist. This Red Cross Nurse, Mollie Lentaigne, drew hundreds of medical illustrations whilst working alongside McIndoe and his peers.[2] Moreover, it is notable that McIndoe, like Gillies, was also an 'adept artist', having been taught by his mother, Mabel Hill – a talented artist herself.[3] McIndoe explained that helping his mother apply stage make-up to actors during his youth taught him 'that you can do all sorts of things to a human face once you learn the knack'.[3]

Rainsford Mowlem, also worked with an artist during this conflict. Diana 'Dickie' Orpen was the daughter of the Irish painter Sir William Orpen, and had studied at Slade School of Art under Tonks.[1] Orpen worked in St Albans and, whilst there, produced approximately 2500 pencil and pen drawings depicting, in great detail, the surgery carried out by Mowlem and his colleagues.[1]

Moving into the modern day, it is evident that the relationship between plastic surgery and art has persisted. This notion is reinforced by the regular publication of articles that debate the place of artistry within contemporary plastic surgery. The influence of art in this speciality can also be denoted by the numerous workshops and courses that offer to teach artistic principles to potential plastic surgeons. These include *Sculpture for Surgeons* in Cambridge and *Building the Body* in Birmingham. The former uses clay sculpting to teach its students the importance of the sense of touch in sculpting and how this sense must be used in conjunction with the practitioner's scrutinising sense of vision. *Building the Body* similarly uses the crafting of wax sculpture to teach its students anatomy whilst also encouraging creativity. With the aim to improve understanding of the aesthetic side of reconstructive surgery, another workshop based in Liverpool, *Surgical Art*, runs a number of courses that incorporate drawing and sculpting, as well as a drawing skills course aimed at potential candidates of the FRCS(plast) exam.

A recent survey of plastic surgery trainees found that seven, out of their cohort of 26, held formal art degrees.[4] Moreover, the majority of the remaining responders reported that they regularly engaged with art, which included drawing, painting, sculpture and photography, as a hobby.[4] However, these statistics could be construed as misleading given the survey's low sample size. What can be appreciated from this survey, however, is that the majority of responders felt courses which combined surgical and artists techniques enhanced their skills.[4]

However, not all agree that art has a definitive place in the practice of plastic surgery. Sepehripour and Patel's survey found that six responders did not consider artistic skills as important, with one exclaiming: 'just because you can draw does not mean you can operate'.[4] There evidently has to be a balance then; whilst some surgeons may find that art can reinforce their skillset, this does not mean that all plastic surgeons must be artists. Eric Swanson, a plastic surgeon who also states a keen interest in art, has weighed in on this issue and has explained that plastic surgeons should remember their medical foundation when considering the importance of art to their practice.[5]

It is undeniable that a tradition of an intimate relationship between art and plastic surgery exists, with many practitioners within the field, both historic and contemporary, who are either keen artists or appreciators of art. This association has culminated in the creation of many courses that harness artistic techniques to further surgical education. Yet, it is important to remember that this does not mean for one moment that being an artist is synonymous with being a capable plastic surgeon. Nevertheless, many would agree that an appreciation for aesthetics is an imperative skill for a plastic surgeon.

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References

1. Meikle M. Reconstructing faces: the art and wartime surgery of Gillies, Pickerill. *McIndoe and Mowlem*. Dunedin: Otago University Press; 2013.
2. Baldwin A. Mollie Lentaigne, the nurse who drew McIndoe's Guinea pigs: exploring the role of a medical artist at the Queen Victoria Hospital, 1940–1945. *J Plast Reconstr Aesthet Surg* 2018;**71**:1207–15.
3. McLeave H. *McIndoe: Plastic surgeon*. London: Frederick Muller Ltd.; 1961.
4. Sepehripour S, Patel J. Art, artistry, and plastic surgery. *Plast Reconstr Surg* 2012;**13**:638–40.
5. Swanson E. The plastic surgeon: artist or scientist? *Plast Reconstr Surg* 2013;**131**:182–4.

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