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ARTICLE

A national needs assessment to identify technical procedures in plastic surgery for simulation-based training

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ABSTRACT

Medical simulation is not developed and integrated into plastic surgery unlike other surgical specialties despite the procedures being complex and require practice. First step in enhancing simulation in plastic surgery is to clarify the need among peers. The objective of the study was to identify and prioritize the technical procedures that should be included in a simulation-based curriculum for residency training in plastic surgery. A panel of participants with key roles in the Danish plastic surgery specialist training program was appointed. Participation was voluntary. A national need assessment study was performed using a three-round Delphi process to collect information from the participants. In round 1, participants reported all the procedures that a newly qualified specialist in plastic surgery should be able to perform. In round 2, participants replied to a survey exploring the frequency of the procedures, the number of surgeons performing the procedure, the risk or discomfort for patients treated by an inexperienced surgeon and the feasibility of training the procedure in simulation, resulting in a preliminary ranking of procedures. In round 3, participants eliminated and reprioritized the identified procedures according to importance. Thirty-five of 37 agreed to enter the expert panel. The response rate was 97%, 86% and 86% for rounds 1, 2 and 3, respectively. Twenty-nine of 136 procedures identified in round 1 reached the final prioritized list of procedures relevant for simulation training in plastic surgery.

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KEYWORDS
Simulation-based training; technical procedures; needs assessment; Delphi process

Introduction

As in most other surgical specialties, education in plastic surgery is mainly based on the traditional apprenticeship approach where junior doctors train to improve their surgical skills in a clinical setting with real patients supervised by a senior doctor. This traditional approach is challenged by increased awareness of patient safety and consequences of sub-optimal treatment, increasing costs of surgical equipment, limited operating room time, reduced trainee working hours and shortened duration of residencies [1]. In order to adapt to these changing conditions, a revised strategy for education in surgical specialties is needed [2].

Simulation-based training in medicine has been developed to practice critical competencies to a certain level before doctors encounter real patients. In surgery, simulation-based training offers the opportunity to acquire, refine and assess the level of surgical skills outside the clinical setting. This ensures that the surgical trainees learn from their errors in a safe and stress-reduced environment without fear of consequences for the patients. This approach promotes both improved learning conditions for the doctors and patient safety by reducing the risk of surgical errors when the doctors enter the clinical setting [3–5].

Compared to other surgical specialties, simulation-based training is neither particularly developed, evaluated nor integrated into plastic surgery. Thomson et al. [6] proposed that one of the reasons for the limited integration of simulation in plastic surgery training could be the difficulties in mimicking soft tissues thereby difficulties in obtaining a realistic experience that translates well into real life surgery. Synthetic models resembling specific anatomical regions such as skin surface for suturing, models for local flaps in the face [7,8], cleft lip and palate [9–11] and breast augmentation [12] are available. The use of living or preserved animals in simulation is well known and widely used such as in microsurgical training programs [13–16]. The use of living animals for simulation, especially large animals as pigs, is limited due to ethical considerations. Small animal models in particular, living or preserved, offer a narrow range of use and are mainly used to train microvascular anastomosis [16,17]. Simulation using cadavers is well known and offers a high degree of realism. Perfused cadaver model is a high fidelity model and tends to replicate real life surgery [18]. It is suitable for training different types of procedures in plastic surgery such as local flaps, muscle flaps, flap dissection for pedicled or free flaps and reduction mammoplasty among others. The disadvantages of simulation with cadavers are limited availability and high cost, especially if the cadaver is perfused [18,19]. Increasing development in digital simulation with increasing quality and diminished cost might change has a potential to profit education in a larger scale [20]. Unfortunately, the content of several simulation-based training programs is decided upon according to the availability of commercial simulators [21] and in less degree based on investigations [22]. The development of curricula should follow a structured approach as suggested by Thomas et al., who proposed a six-step process starting with problem identification and a general needs assessment to identify *what* to teach [23].

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To our knowledge, a national, systematic identification and needs assessment of simulation-based training in plastic surgery has not been performed previously.

The objective of the study was to identify and prioritize the technical procedures that should be included in a simulation-based curriculum for residency training in plastic surgery.

Materials and methods

Study design

We used the Delphi method which is widely accepted as a tool to achieve convergence among a group of experts on a specific topic [24]. It is an anonymous, structured approach that uses a series of questionnaires to collect information. The collected responses are analyzed and presented back to the panel in an iterative process until consensus is achieved. We followed this methodical approach to perform a general needs assessment to identify technical procedures in plastic surgery relevant for learning in a simulation-based environment [25].

Population

The participants in this study were identified due to their formal role and proven engagement in education on a local or national level. Moreover, we aimed to include participants currently under specialty training to ensure their perspectives were included. We invited all; Professors, Postgraduate clinical associate professor, National head of specialty training, Danish Society for Plastic and Reconstructive surgery (DSPR) Educational board, head of departments, Educational program director, Educational program director assistants, Board members of the Danish Society of Junior Plastic Surgeons and Senior residents in specialist training program, years 4 and 5 of 5. The participants were purposely invited to represent the opinions of plastic surgeons across the country and with regard to the level of experience among the invited participants. Participation was voluntary. In total, 37 of the identified persons accepted to participate. We ensured representation from all Danish departments and thereby ensured representation from all subspecialties in plastic surgery (Table 1).

Setting

There are considerable variations in which treatments are offered within plastic surgery between otherwise comparable countries. In Denmark, there are public plastic surgical departments in all five Health Care Regions. Each Health Care Region covers a broad specter of treatments in general plastic surgery, reconstructive surgery and as well as dermato-oncologic surgery. Subspecialties in terms of vascular malformations, burns treatment and cleft surgery are centralized in either two or one center in Denmark. Treatments offered by plastic surgeons in other countries, but not in Denmark, include; hand surgery, facial bone fractures and cranioplasties. These are treated by orthopedic surgeons, ear–nose–throat or maxillofacial surgeons and neurosurgeons, respectively.

Table 1. Key experts in clinical education in plastic surgery.

Roles	Number
Professor	2
Postgraduate clinical associate professor	2
National head of specialty training	1
Head of department	7
Educational program director	7
DSPR Educational board[a]	13
Educational program director assistant	4
Board of the Danish Society of Junior Plastic Surgeons	5
Senior residents in specialist training program, years 4 and 5 of 5.	11
Total (does not summarize, as some persons have more than one role)	37

DSPR: Danish Society of Plastic and Reconstructive Surgery

Dotted line: Indicates the level of experience among participants (above the dotted line are more experienced post-specialization participants and below the line are the less experienced pre-specialization participants.

[a]DSPR Educational board consists of all educational program directors, national head of specialty training, chairman of DSPR and chairman of the Danish Society of Junior Plastic Surgeons.

Data collection and administration

Data collection was performed from June 2017 to April 2018. The study was designed as a three-round Delphi process to collect information from the participants. Emails, web-based questionnaires and telephone calls were used for communication.

A research steering group consisting of four members was formed to facilitate data collection and analysis; a senior resident doctor and educational program director assistant (assisting the educational program director in local implementation and administration of educational initiatives and requirements) (AK), a consultant doctor in plastic surgery, educational programme director and postgraduate clinical associate professor (JHN), a professor in medical simulation and head of research at Copenhagen Academy for Medical Simulation (CAMES) (LK) and a researcher in simulation-based education (LJN). The research steering group is also the authors of this article and the initials can be read in the parentheses.

Delphi round 1

This round consisted of a 'brainstorming phase' where all the participants were asked to report the technical procedures that a newly qualified specialist in plastic surgery should be able to perform. For the purpose of the study, technical procedures were defined as a clinical practical procedure. The research steering group summarized the collected information and all non-technical procedures were eliminated (e.g. communication training). The technical procedures from round 1 were compiled in broader categories with other closely associated procedures for further evaluation.

Delphi round 2

This round consisted of a survey in which the participants were asked to quantify different aspects in order to evaluate the importance of simulation training of each technical procedure identified and grouped in round 1. This was done using the CAMES' 'Needs assessment formula' (NAF) [10] defined as;

$$\text{NEED for simulation} - \text{based training} = \text{Frequency} \times \text{No. of Physicians} \times \text{Impact} \times \text{Feasibility}$$

The NAF quantifies the need for simulation-based training of a specific procedure ('NEED'), 'Frequency' is the number of procedures performed annually in each department, 'Physicians' is the number of physicians who should be able to perform this procedure, 'Impact' is discomfort and risk if the procedure is performed by an inexperienced physician, 'Feasibility' is the feasibility of learning the procedure in a simulation-based environment. To assess each element in the CAMES NAF, we developed an online survey. The participants assessed three items: (1) 'How often is the procedure performed in your department?' was quantified using five-point scale with the anchors; 'never', 'less than once per month', 'one to three times per month', 'once per week' and 'more than once per week', (2) 'How many doctors in your department must be able to perform the procedure?' was assessed in five steps from 'none', 'up to 25%', '26-50%', '51-75%' and '76-100%' and (3) The statement 'The procedure is very uncomfortable and/or risky to the patient if performed by an inexperienced doctor' was assessed using a five-point Likert scale anchored by degree of agreement, with 1 as 'strongly disagree' and 5 as 'strongly agree'. The fourth element of the formula is feasibility (4). The steering group explored feasibility by assessing three elements; suitability for simulation-based training, equipment availability and associated costs of each procedure using five-point Likert scales ranging from 1 to 5. All types of simulation (e.g. part-task trainer, full-body simulator, healthy volunteer, animal model, cadaver, virtual reality, augmented reality, etc.) were considered.

The CAMES NAF score for each procedure is the sum of the mean scores of the four factors giving each factor 25% weight. The resulting total CAMES NAF score from 4 to 20. The preliminary prioritized list contains each procedure rank according to the NAF score. The CAMES NAF score has been used in numerous publications and is an integrated part of the prioritization process [25].

At the end of round 2, the procedures were prioritized according to the four elements of the CAMES NAF.

Delphi round 3

In round 3, the preliminary prioritized list based on the NAF of technical procedures from round 2 was sent to the participants for final review. In this process, they were asked to eliminate technical procedures they found unsuitable to be taught in a simulation-based environment and had the opportunity to reprioritize the remaining technical procedures according to importance.

It was predetermined that a procedure would be eliminated from the final list if more than one-third of the participants eliminated it during round 3.

Statistical analysis

Round 1 used a summative approach to qualitative analysis to review and group technical procedures into categories. In round 2, the total mean was calculated for each procedure item. The CAMES NAF was used to calculate and produce a preliminary ranked list of procedures. In round 3, the number of occurrences for each response was calculated using frequency analysis. The principle of a two-thirds qualified majority was applied. Procedures that gained a score of less than 66.7% as suitable for simulation were eliminated. Descriptive analysis was calculated to produce a final prioritized list. We explored the changes in the ranking between round 2 and round 3 by calculating Spearman's rho correlation coefficient. All statistical calculations were performed using IBM SPSS Statistics version 22 (IBM Corp., Armonk, NY).

Results

Thirty-seven participants were invited to participate in the study. Two declined to participate due to busy schedules and the remaining 35 experts were included in the final panel. All included participants received questionnaires in the three rounds of the Delphi process. It was not a prerequisite that the participants responded to prior questionnaires. The Delphi process resulted in a prioritized list of technical procedures that should be included in a simulation-based curriculum (Figure 1).

Results of Delphi round 1

A total of 97% (34 out of 35 participants) completed the first round of the Delphi process, and 136 clinical procedures were collected. These were summated and reduced to 44 groups of technical procedures that were used in round 2.

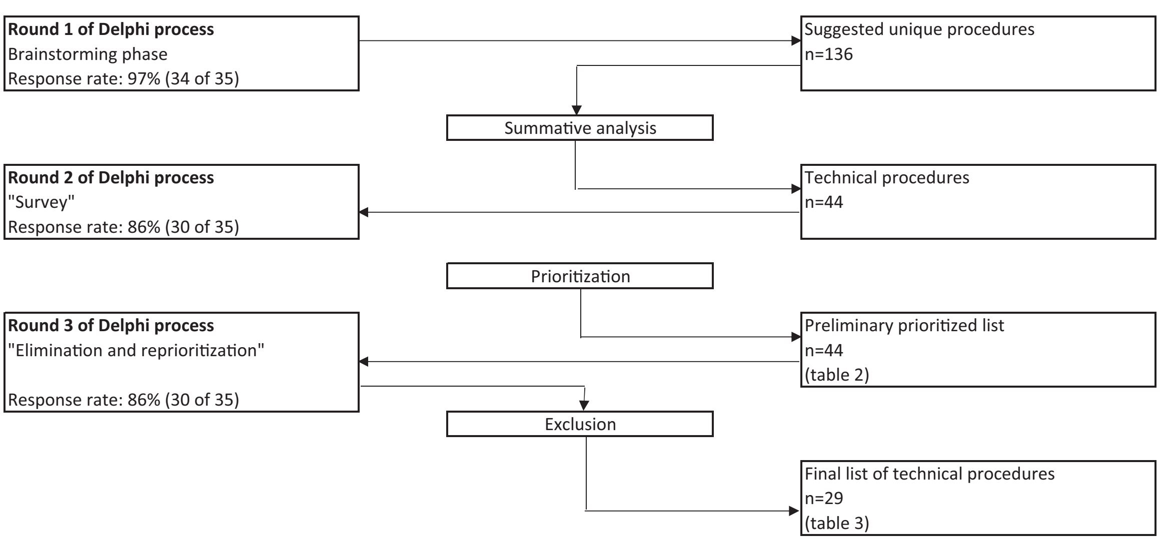

Figure 1. Flow chart of the Delphi process including response rates and results of each round.

Table 2. Technical procedures with preliminary ranking according to NAF.

Rank	Name	Content
1	Suture technique	Suture technique, surgical knot technique, suture of fascia, dermis, stick tie and ligature
2	Local flaps and skin plasties	VY-, YV- and Z-plasties, local flaps (random, axial – transposition, advancement and rotation)
3	Basic plastic surgery	Excision and re-excision, scar correction, dog-ear correction, dissection technique and tissue handling
4	Skin transplantation	Full and split thickness skin grafts, donor skin removal with Watson knife, electric or pneumatic dermatome and excision
5	Wound treatment	Acute and chronic wound treatment, debridement, NPWT
6	Reduction mammoplasty	Orlando, McKissock, Hall-Findlay and Lejour
7	Sentinel node biopsy	Head and neck, axilla and inguinal
8	Clinical examinations	Breast examination, lymph node palpation, examination of facial bone fractures, palpation of subcutaneous tumors and flap monitoring
9	Breast reconstructions	Implant, expander prosthesis and expansion, use of ADM
10	Nasal reconstructions	Frontal-flap, nasolabial flap (various designs), frontal-nasal flap, bilobed and trilobed flap and other flaps
11	Peripheral vein catheter	
12	Liposuction and lipografting	Tumescent technique, liposuction, lipotransplantation and scar release
13	Urethral catheter	
14	Ultra sonic and Doppler scan	Examination and puncture of seroma and hematoma, examination of lymph nodes and identification of perforator arteries
15	Blood samples	
16	Breast augmentation	Implant selection and implantation
17	Massive weight loss-surgery	Abdominal plasty, upper body lift, lower body lift, brachial plasty and femoral plasty
18	Gynecomasty	Liposuction and excision
19	Lip and cheek reconstructions	Cheek rotation flap, staircase technique, Abbe-flap, Estlander-flap, wedge-resection and other flap designs
20	Lymph node dissection	Neck, axillar, inguinal and iliacal
21	Microsurgical suture and anastomosis technique	Use of microscope, dissection, nerve suturing, artery and vein anastomosis
22	Ear reconstructions	Correction of aures alatae, wedge-resection, antia-buch plasty and other otoplasties
23	Burn treatment	Necrectomy, escharotomy and contracture release
24	Perforator flaps	ALT, TDAP, DIEP, SIEA, SGAP, radial forearm flap and 'free-style flaps'
25	Arterial puncture	
26	Blepharoplasties	Upper and lower eyelid
27	Plastic surgery in trauma and 'Damage control surgery'	Facial lesions, vessel lesions, nerve lesions and decollement
28	Muscle, muscle-cutaneous and osteocutaneous flaps	Tensor fascia lata flap, gracillis flap, gastrocnemius flap, fibula flap, sural flap and latissimus dorsi flap
29	Eyelid reconstructions	Tarsoconjungtival flap, canthotomy and 'closure of eyelid defect'
30	Hand surgery and amputations	Hand surgery, amputations of fingers and toes
31	Tissue expansion (not breast)	
32	Composite graft	
33	Abdominal wall reconstructions	Midline hernia surgery (various reconstructions), use of ADM and correction of rectus diastasis
34	Facelift	Facelift, brow/forehead lift
35	Tracheostomy	
36	Sural biopsy	
37	Excenteratio bulbi	
38	Thoracic wall reconstruction	
39	Rhinoplasties	
40	Other microsurgery	Nerve transplantation, resection of costae and jejunal flap
41	Cleft lip and palate repair	
42	Transgender surgery	
43	Uro-genital reconstructions	
44	Hyperthermal isolated limb perfusion	

NPWT: negative pressure wound therapy; ADM: acellular dermal matrix; ALT: antero-lateral thigh; TDAP: thoracodorsal artery perforator; DIEP: deep inferior epigastric perforator; SIEA: superficial inferior epigastric artery; SGAP: superior gluteal artery perforator.

Results of Delphi round 2

The response rate of the second round was 86% (30 out of 35 participants). A preliminary prioritized list was generated using the CAMES NAF (Appendix 1 displays the scores from Delphi round 2). Table 2 presents a complete list of the ranking.

Results of Delphi round 3

The response rate for the third round was 86% (30 out of 35 participants). Sixteen technical procedures were eliminated. The final, prioritized list included 29 technical procedures that should be included in a simulation-based curriculum for specialist training in plastic surgery.

A strong correlation was found between the ranking order of the procedures as determined by the CAMES NAF in round 2 and the final ranking order in round 3 (Pearson correlation 0.95, $p<.001$) (Figure 2).

Discussion

Key experts in education in plastic surgery were invited to participate in a three-round Delphi process, resulting in a prioritized list of 29 technical procedures that should be included in a

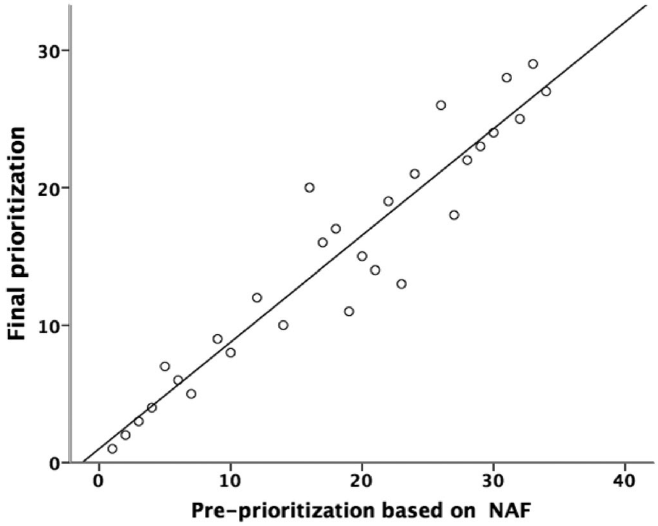

Figure 2. The correlation between the ranking order from round 2 (pre-prioritization) and the ranking order from round 3 (Final prioritization). NAF: Needs assessment formula.

simulation-based curriculum. This list consists of different procedures across the different plastic surgical sub-specialties and emphasizes both reconstructive and aesthetic surgery (Table 3).

The expert panel of participants was established in order to ensure that all departments were represented and that both young and experienced key persons in education were included. Of the two persons declining to participate, one was resident in plastic surgery specialist training and one was experienced in both plastic surgery and education. All departments of plastic surgery in Denmark were represented in the study despite the drop-out of two participants, thereby ensuring that all subspecialties in plastic surgery in Denmark were represented.

There are no specific recommendations on the number of participants, although previous studies suggest 20–30 participants to be sufficient in a homogeneous population, which we consider plastic surgery in Denmark to be [25]. We achieved very high response rates in all three rounds of the Delphi process. The quality and reliability of the Delphi process are based solely on the responses from participants and their willingness to contribute.

We found a high correlation between the preliminary and final ranking of the procedures (Table 3). 'Plastic surgery in trauma and Damage control surgery' ranks 18 of 29 in the final prioritization. This group of procedures represents non-elective surgical competencies that are especially difficult to train sufficiently with supervisors in the clinical setting. Lymph node dissection ranks 15 of 29 in the final prioritization. This might be influenced by the results from the second 'Multicenter Selective Lymphadenectomy Trial' that caused a shift in treatment strategy for disseminated melanoma disease leading to fewer lymph node dissections. Examinations using ultrasound and Doppler scan ranks 10 of 29 in the final prioritization. This is surprising as it is not a traditional surgical procedure, but it probably reflects an increasing interest in using perforator-based flaps for various reconstructions. Treatment of cleft lip and palate and treatment of burns achieved a low ranking in round 2 (rank 41 of 44 and rank 23 of 44, respectively) and treatment of cleft lip and palate was eliminated from the final list in round 3, although both are considered as cornerstones in reconstructive plastic surgery. In Denmark, surgical treatment of cleft lip and palate is centralized to one institution and only very few surgeons do this surgery. Similarly, treatment of burns is centralized to two departments. This probably explains why the surgical procedures scored low in round 2 and why treatment of cleft lip and palate was eliminated in the final round. The majority of the identified procedures are in areas considered as reconstructive surgery. This might reflect that 34 of the 35 participants primarily work within the reconstructive field in public hospital departments. In Denmark, there is public reimbursement for some procedures depending on severity of the disorder which in other countries might be considered as aesthetic surgery. For example, correction of blepharoptosis, aures alatae, gynecomastia, breast hypertrophy, breast asymmetry, breast aplasia, excess skin after massive weight loss and gender affirming surgery are performed in both public departments and aesthetic clinics with or without reimbursement. A substantial, but unknown share of the participants, is or has been working in the aesthetic practice. Therefore, we expect that aesthetic aspects of plastic surgery have been considered by the participants, which also reads in the final prioritized list (Table 3). This list includes different procedures traditionally considered as aesthetic surgery; correction of breast hypertrophy, excess skin after massive weight loss, gynecomastia and blepharoptosis – and also breast augmentation and facelift.

One of the main challenges of today's clinical education and training is not only the integration of simulation into the curriculum but also the identification of which programs to develop and investigate for effect. Needs assessment is the initial step in curriculum design. This study followed a structured Delphi approach to produce a prioritized list that could serve as a foundation for simulation program development. The CAMES NAF formula quantifies the importance of simulation training based on the four elements included in the formula being; frequency of the surgery, number of physicians performing the surgery, impact and feasibility.

There are limitations to this study. We achieved very high response rates, although rounds 2 and 3 had a lower response rate than round 1, probably because of time and cognitive load requirements to complete the multi-response survey. Nevertheless, every department across the country was represented. The study was performed at a national level and therefore the results reflect the training practices and requirements of specialist training in plastic surgery in Denmark. These results do not necessarily translate directly to other countries. There are significant variations in the organization and which treatments are provided in plastic surgery between otherwise comparable countries. Hand surgery, facial bone fractures and cranioplasties for example are not treated by plastic surgeons in Denmark as in other countries, but are treated by orthopedic surgeons, ear–nose–throat or maxillofacial specialists and neurosurgeons, respectively. However, hand surgery was identified in our investigation and preliminary ranked 30 out of 44 procedures in the second round, probably because all residents in plastic surgery specialist training in Denmark are employed in an orthopedic department with hand surgery as part of their education. This is done to ensure that the education is generalizable internationally.

We believe that most of the included procedures are generalizable. Educators in Denmark and other countries may use the list as a foundation to design simulation-based training programs according to their guidelines and practices.

In conclusion, the national needs assessment following a standardized Delphi process identified a prioritized list of 29 clinically relevant technical procedures in plastic surgery that are suitable for simulation-based training. With this list, we hope to encourage educators in plastic surgery to develop and evaluate

Table 3. Final list of technical procedures after elimination and reprioritization.

Rank	Preliminary rank	Name	Content
1	1	Suture technique	Suture technique, surgical knot technique, suture of fascia and dermis, stick tie and ligature
2	2	Local flaps and skin plasties	VY-, YV- and Z-plasties, local flaps (random, axial – transposition, advancement and rotation)
3	3	Basic plastic surgery	Excision and re-excision, scar correction, dog-ear correction, dissection technique and tissue handling
4	4	Skin transplantation	Full and split thickness skin grafts, donor skin removal with Watson knife, Zimmer-dermatome and excision
5	7	Sentinel node biopsy	Head and neck, axilla and inguinal
6	6	Reduction mammoplasty	Orlando, McKissock, Hall-Findlay and Lejour
7	5	Wound treatment	Acute and chronic wounds, NPWT
8	10	Nasal reconstructions	Frontal-flap, nasolabial flap, frontonasal flap, bilobed and triloped flap
9	9	Breast reconstructions	Implant, expander prosthesis and expansion, use of ADM
10	14	Ultra sonic and Doppler scan	Examination and puncture of seroma and hematoma, examination of lymph nodes and identification of perforator arteries
11	19	Lip and cheek reconstructions	Cheek rotation flap, staircase technique, Abbe-flap, Estlander-flap and wedge-resection
12	12	Liposuction and lipografting	Tumescent technique, liposuction, lipotransplantation and scar release
13	23	Burn treatment	Necrectomy, escharotomy and contracture release
14	21	Microsurgical suture and anastomosis technique	Use of microscope, nerve suturing, artery and vein anastomosis
15	20	Lymph node dissection	Neck, axillar, inguinal and iliacal
16	17	Massive weight loss-surgery	Abdominal plasty, upper body lift, lower body lift, brachial plasty and femoral plasty
17	18	Gynecomasty	Liposuction and excision
18	27	Plastic surgery in trauma and 'Damage control surgery'	Facial lesions, vessel lesions, nerve lesions and decollement
19	22	Ear reconstructions	Correction of aures alatae, wedge-resection, antia-buch plasty and other otoplasties
20	16	Breast augmentation	Implant selection and implantation
21	24	Perforator flaps	ALT, TDAP, DIEP, SIEA, SGAP, radial forearm flap and 'free-style flaps'
22	28	Muscle, muscle-cutaneous and osteocutaneous flaps	Tensor fascia lata flap, gracillis flap, gastrocnemius flap, fibula flap, sural flap and latissimus dorsi flap
23	29	Eyelid reconstructions	Tarsoconjungtival flap, canthotomy and 'closure of eyelid defect'
24	30	Hand surgery and amputations	Hand surgery, amputations of fingers and toes
25	32	Composite graft	
26	26	Blepharoplasties	Upper and lower eyelid
27	34	Facelift	Facelift, brow/forehead lift
28	31	Tissue expansion (not breast)	
29	33	Abdominal wall reconstructions	Hernia surgery (inlay, underlay and Ramirez), use of ADM and rectus diastasis)

NPWT: negative pressure wound therapy; ADM: acellular dermal matrix; ALT: antero-lateral thigh; TDAP: thoracodorsal artery perforator; DIEP: deep inferior epigastric perforator; SIEA: superficial inferior epigastric artery; SGAP: superior gluteal artery perforator.

simulation-based training programs where it is most needed and beneficial.

Participation

All authors have contributed to the study, the preparation of the manuscript, have accepted the submitted version of the manuscript and agreed to their inclusion.

Disclosure statement

Nothing to disclose. Presented at Scandinavian Association of Plastic Surgeons Congress 2018, Copenhagen, Denmark.

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Appendix 1. Procedures ranked according to CAMES NAF score and with displayed scores in the four CAMES NAF formula variables. Based on responses from Delphi round 2.

Procedure	Frequency*	No. of physicians**	Impact***	Feasibility****	CAMES NAF Score
Suture technique	5.00	5.00	3.70	5.00	4.68
Local flaps and skin plasties	4.96	4.56	4.37	4.67	4.64
Basic plastic surgery	5.00	4.96	3.74	4.33	4.51
Skin transplantation	4.96	5.00	3.74	3.67	4.34
Wound treatment	4.70	4.81	3.63	4.00	4.29
Reduction mammoplasty	4.19	4.11	4.67	4.00	4.24
Sentinel node biopsy	4.93	4.44	4.26	3.33	4.24
Clinical examinations	4.93	4.81	3.81	3.33	4.22
Breast reconstructions	4.78	3.48	4.56	4.00	4.20
Nasal reconstructions	3.85	3.74	4.59	4.33	4.13
Peripheral vein catheter	4.63	4.74	3.30	3.67	4.08
Liposuction and lipografting	4.70	4.07	4.19	3.33	4.07
Urethral catheter	4.19	4.78	3.37	3.67	4.00
Ultra sonic and doppler scan	3.74	3.74	3.74	4.67	3.97
Blood samples	4.37	4.67	3.15	3.67	3.96
Breast augmentation	3.93	3.59	4.52	3.67	3.93
Massive weight loss-surgery	3.78	3.74	4.33	3.67	3.88
Gynaecomasty	3.48	4.19	4.26	3.33	3.81
Lip and cheek reconstructions	3.11	3.33	4.59	4.00	3.76
Lymph node dissection	3.15	3.15	4.74	4.00	3.76
Microsurgical suture and anastomosis technique	3.48	2.33	4.78	4.33	3.73
Ear reconstructions	3.04	3.26	4.52	4.00	3.70
Burn treatment	3.04	3.63	4.30	3.67	3.66
Perforator flaps	3.59	2.78	4.81	3.33	3.63
Arterial puncture	3.00	4.63	3.22	3.67	3.63

(continued)

Continued.

Procedure	Frequency*	No. of physicians**	Impact***	Feasibility****	CAMES NAF Score
Blepharoplasties	2.63	3.70	4.37	3.67	3.59
Plastic surgery in trauma and "Damage control surgery"	2.15	3.44	4.41	4.00	3.50
Muscle, muscle-cutaneous and osteocutanous flaps	3.15	2.70	4.74	3.33	3.48
Eyelid reconstructions	2.33	2.74	4.78	4.00	3.46
Hand surgery and amputations	2.19	3.04	4.30	4.00	3.38
Tissue expansion (not breast)	2.04	2.48	4.56	4.33	3.35
Composite graft	2.37	3.19	4.37	3.33	3.31
Abdominal wall reconstruction	2.22	2.44	4.67	3.33	3.17
Facelift	1.78	2.11	4.78	3.67	3.08
Tracheostomy	1.63	1.74	4.67	4.00	3.01
Suralis biopsy	1.56	2.56	4.04	3.67	2.95
Excenteratio bulbi	1.37	1.59	4.67	4.00	2.91
Thoratic wall reconstruction	1.56	1.74	4.67	3.67	2.91
Rhinoplasty	1.26	1.81	4.74	3.67	2.87
Other microsurgery	1.74	1.74	4.89	2.33	2.68
Reconstruction of ceft lip and palate	1.67	1.22	4.85	2.67	2.60
Transgender surgery	1.48	1.33	4.78	2.33	2.48
Uro-genital reconstructions	1.33	1.33	4.78	2.00	2.36
Hypertermic isolated limb perfusion	1.19	1.22	4.52	2.00	2.23

Variables Score	1	2	3	4	5
Frequency*; How often is the procedure performed in your department?	Never	Less than once per month	One to three times per month	Once per week	More than once per week
No. of physicians**; How many doctors in your department must be able to perform the procedure?	None	Up to 25%	26-50%	51-75%	76-100%
Impact***; The procedure is very uncomfortable and/or risky to the patient if performed by an inexperienced doctor	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
Feasibility****; mean of summarized score					
Applicable available equipment	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
Highly suitable to train in simulation	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
Associated costs	Very high cost	high cost	Intermediate cost	Low cost	Very low cost