Survey of the specializing doctor training in orthopedics and traumatology across university hospitals in Finland

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Submitted 2020-12-03. Accepted 2021-03-04.

This annotation describes the results from national audit of the orthopedics and traumatology specialization program and specializing physicians’ skills across all 5 university hospitals in Finland (Helsinki University Hospital, HUH; Kuopio University Hospital, KUH; Tampere University Hospital, TAYS; Turku University Hospital, TYKS; and Oulu University Hospital, OYS).

Competency-based training in surgical specialties is gathering more interest worldwide (Nousiainen et al. 2018, Gustafsson et al. 2019, LaPorte et al. 2019). In Finland, at the end of 2018, a reform of specializing physician training and also of the whole specialist training in surgery was launched, aiming at taking steps towards competency-based education (Paananen 2017, Seppänen 2018). The previous specialization curriculum was time dependent, taking 6 years of surgical training at minimum. It included 9 months in primary healthcare service, a minimum of 2 years and 3 months of general surgical training at a central hospital, after which more focused specialty training (such as orthopedics and traumatology) took place in a university hospital (3 years or more). The competency of a consultant orthopedic surgeon was then granted after finalizing the national specialization exam, consisting of 5 freely formulated questions concerning orthopedics and traumatology.

As a result of the reform in Finland, the narrower specialty of surgery must currently already be decided at the application phase. The actual specialization includes a 12-month surgical orientation period in various areas of surgery, followed by a 6-month trial period in a narrower specialty, such as orthopedics and traumatology. After the trial period, there is 9–12 months of competency-based general education in a narrower specialty and then a 3-year differentiating phase. At least 1 year of training must be completed at a university hospital and at least 1 year at a central hospital. Therefore, differences may be found in Finnish specialist training in comparison with other countries (reviewed earlier). For an example, in the United Kingdom (UK), Trauma & Orthopedic surgery training initially includes a 2-year Foundation Training in different specialties of medicine, and after that doctors apply for a Core Surgical Training (CST) program for the next 2 years. CST includes 4- to 6-month periods in different areas of surgery. After CST, junior surgeons apply for a Specialist Surgical Training program, which typically lasts 6 years and ends with a specialty exit exam. After passing the exam a Certificate of Completion of Training is received (BOTA Collaborations and Rashid 2018).

Compared with other European countries in addition to the UK, France and a few other countries do not have any mandatory course training, in comparison with Finland where 80 hours is required. On the other hand, in Croatia and Denmark the requirement is over 300 hours of course training. The highest minimum numbers of required surgical procedures are in the UK and Ireland—1800 procedures—whereas in Finland there are no specified requirements. In Finland there is a final written exam, but for example in Sweden there is no exam at all (Madanat et al. 2017). The present annotation provides extensive information on the different areas of specialization training in orthopedics and traumatology.

Electronic survey
The electronic audit questionnaire (Supplement 1) was compiled for specializing physicians (registrars) in orthopedics and traumatology using the SurveyMonkey tool. The questionnaire was sent by e-mail link to all specializing physicians (n = 61) at the time of the audit, i.e., April to June 2019. All
of these specializing physicians had completed the common trunk of their surgical training at the time of the audit. They are also part of the old system of specialist training before the reform at the end of 2018, when specialist training was time dependent, taking 6 years minimum, and general surgical training in various fields of surgery was 15 months in duration. Since the reform at the end of 2018, specialist training includes a 12-month orientation period in various fields of surgery and after that is focused only on the narrower specialty, for example orthopedics and traumatology, and is more competency-based than time dependent. The questionnaire included around 100 questions regarding surgical skills and education, clinical and scientific work, and other aspects of specializing physician training. The data was pseudonymized and the respondents gave permission to use the answers for research purposes.

The audit included 2 questions on the amount of and competency in orthopedic and traumathological procedures performed. These numbers were a subjective estimate made by the specializing physicians themselves. 9 respondents gave indefinite, non-numerical answers and were eliminated. 14 respondents gave answers such as “100–200” or “100+,” in which case we considered the mean of the range as the definite answer or the lowest reported number.

Educational views (Supplement 2)

36 (mean age 35 years, 23 male) of 61 submitted surveys were answered. 3 respondents answered only the first question and were eliminated from the analyses.

22 respondents considered job description to be the most important factor when choosing a future job. Interestingly, all respondents intend to work as an orthopedist in a public hospital or facility in the future after the specialization program rather than the private sector.

26 respondents consider that university hospitals have a good or very good opportunities for accessing leadership training. However, 10 respondents consider the opportunities to be poor or very poor. According to the respondents, leadership training is offered for an average of 0–30 credits and is free of charge. Almost all (32) respondents have calendar time set aside for meeting-type training (approximately 3 hours per week). However, no working time is set aside for preparation of meeting presentations.

Surgical skills training (Supplement 3)

When considering the traumatological procedures done by specializing physicians, all respondents have operated on a hip fracture with a trochanteric nail, operated on an ankle fracture, and 33 respondents have done a plate fixation of a wrist fracture independently in some way. In contrast, one-third have operated on a proximal humerus fracture and one-fifth have operated a vertebral fracture independently.

When considering the orthopedic procedures performed by specializing physicians independently, none of the respondents have operated on a knee cruciate ligament or collateral ligament with a graft and only 1 has done medial patellofemoral ligament reconstruction independently. One-fourth have done shoulder decompression independently and 5 respondents have operated on a rotator cuff rupture. In contrast, 34 respondents have removed osteosynthesis material independently and 33 have done carpal canal release independently.

Synthesis of the survey

In this study, we audited the content of the specialist training program in Finland before the reform at the end of 2018. In this way, it will be possible to evaluate the success of renewed training in the future by implementing the survey again after 3–4 years. Most likely there will be changes in the duration of the specialization. Also, the number of independently performed surgical procedures may increase as the narrower specialty of surgery is already decided in the application phase and because the training is more competency oriented.

According to the present audit, all of the respondents intend to work as a specialist at a public hospital or facility in the future and none of the respondents are considering working in the private sector. In many countries, it is common to enter a fellowship after specialization in orthopedics and traumatology. This is not the case in Finland, and the interest in working in the public sector might be due to fact that the respondents want to gather more experience after graduation before working in the private sector. In Finland, specialization in orthopedics and traumatology does not officially include a working period in the private sector. Accordingly, this may influence reluctance to consider a private hospital as a future employer.

Specializing physicians gave a self-estimated number of how many independently performed procedures they have done already. A common logbook at the national level is paramount to obtain more exact information on the true number of procedures. At present, steps at the national level have been taken to introduce such a uniform logbook.

Recent evidence favors a nonoperative treatment line for several orthopedic conditions. As an example, the number of independently performed surgeries on proximal humerus fractures was quite low, which may reflect treatment policies. Also, the number of arthroscopic procedures was low, reflecting recent evidence.

The overall response rate was modest. Two-thirds of the specializing physicians in Finland responded to the survey, but this sample can be considered quite representative as all university hospitals were included.

This audit did not include a section on pediatric orthopedics. Pediatric orthopedics is a subspecialty in Finland and is not provided in all university hospitals due to lack of resources. The purpose in this annotation was to audit basic training in orthopedics and traumatology provided at all university hospitals.

In conclusion, according to our survey of the orthopedic specialization in Finland, the number of key orthopedic procedures was found to be quite high. The survey also provides
widespread information on the general training conditions of specializing physicians in orthopedics and traumatology in Finland. In the future, auditing will be easy to extend to other areas of medical specialization too. The information can be used directly to develop the structure and content of specialist training. In the first instance, the procedures should be taught according to evidence-based medicine. According to the results of the questionnaire, the amount of arthroscopy training should be increased. Also, new audits in other countries can be compared to further develop specializing-doctor training. The effect of the renewal on specialization training remains to be seen after follow-up audits. Arthroscopy training may be improved by modern VR (virtual reality) based simulators. Also, other VR surgical training is evolving and may substantially change the training in widespread areas of orthopedics and traumatology.

**Funding and potential conflicts of interest**

This annotation did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The authors report no declarations of interest. Full results of the survey are available from the authors upon reasonable request.

**Supplementary data**

Supplements 1–3 are available in the online version of this article, http://dx.doi.org/10.1080/17453674.2021.1910772

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Supplementary data

Supplement 1. University hospital training audit for orthopaedics and traumatology 2019 – specializing physicians

Q1. Do you consent to having your answers used for research purposes?
   I do
   I do not

Q2. Age (years)

Q3. Sex
   Male
   Female

Q4. Current place of work (e.g. name of hospital)

Q5. At which hospital(s) did you carry out your introductory training?

Q6. At which university hospital are you carrying out your specialty training?
   - Kuopio University Hospital
   - Helsinki University Hospital
   - Tampere University Hospital
   - Turku University Hospital
   - Oulu University Hospital

Q7. Education
   - Lic.Med.
   - D.Med.
   - Docent

Q8. Do you have a prior Specialist Degree in Medicine?
   No
   Yes, please specify: How long did it take for you to complete foundation training?

Q9. How many full years have you been in specialty training?

Q10. Permanent position
   - Specialisation position
   - Deputy
   - Other (please specify)

Q11. Have you read your university’s syllabus (“study guide”) for specialty training in medicine?
   Yes
   No

Q12. Do you know where to find the study guide for specialty training?
   Yes
   No

Q13. Have you passed your medical specialist’s examination?
   Yes
   No

Q14. After graduation, how long have you been working as a doctor in orthopaedics? (please round off to the nearest month, e.g. 2 years 3 months)

Q15. Of that time, how long have you worked at a regional hospital?

Q16. Of that time, how long have you worked at a central hospital?

Q17. Of that time, how long have you worked at a university hospital?

Q18. Of that time, how long have you worked elsewhere? Where? Please specify.

Q19. How much of your specialty training have you spent or how much of you specialty training has been allocated for conducting research?

Q20. How long have you worked at your current workplace?

Q21. How long have you been working as acting senior orthopaedist?

Q22. Did you consider other specialties before choosing orthopaedics?
   Yes
   No

Q23. After completing your specialty training, on what grounds will you be choosing your place to work? Please rank the following in order of importance. (1=most important, 8=least important)
   - Salary
   - Location
   - Patient material at the workplace
   - Emergency duty
   - Opportunity for flexible working hours
   - Job description
   - Open permanent position/vacancy
   - Being approached by the employer
   - Other (please specify)

Q24. After having completed your specialty training, are you going to primarily work
   - As an orthopaedist at a public sector hospital or institution
   - In administration in the public sector
   - As a researcher or teacher
   - As a self-employed person
   - As an expert
   - As something else, please specify
Q25. Are you aware of the contents of the core content analysis of your university's orthopaedic specialty training?
   Yes
   No

Q26. How do you take part in training/instructing other specialising doctors, candidates of medicine, or persons in complementary specialty training?
   Yes
   No

Q27. Are you aware of there being an annual curriculum/training plan for specialising physicians?
   Yes
   No
   If you answered ‘Yes’, what can you tell about its contents?

Q28. If your clinic has an annual curriculum/training plan (e.g. rotational training), can the specialising physicians influence its contents?
   Yes
   No

Q29. Is there a person at your clinic who has been appointed responsible for developing the medical specialty training?
   Yes
   No
   I do not know

Q30. Do you have or have you had a personal advisor or tutor?
   Yes, at the regional hospital
   Yes, at the central hospital
   Yes, at the university hospital
   I have had the same advisor/tutor throughout my specialty training
   I have not had an advisor/tutor at any stage

Q31. Do you and your supervisor have an annual counselling or feedback discussion?
   Yes
   No

Q32. Do you have a personal study plan?
   Yes
   No

Q33. How frequently is your personal study plan updated (e.g. in a performance appraisal discussion)? Please provide the answer in months.

Q34. Do you receive oral feedback on your skills and work?
   Yes
   No
   If you answered ‘Yes’, how often? (monthly, every 3 months, once a year, more infrequently)

Q35. Do you receive written feedback on your skills and work?
   Yes
   No
   If you answered ‘Yes’, how often? (monthly, every 3 months, once a year, more infrequently)

Q36. Are you asked to provide regular written feedback on your training?
   Yes
   No
   If you answered ‘Yes’, how often? (monthly, every 3 months, once a year, more infrequently)

Q37. Are you asked to provide regular oral feedback on your training?
   Yes
   No
   If you answered ‘Yes’, how often? (monthly, every 3 months, once a year, more infrequently)

Q38. What other means of giving feedback on your training do you have?

Q39. Have you been allocated time for preparing for your medical specialist’s examination?
   Yes
   No

Q40. Is it easy for you to get a leave of absence or active leave to prepare for the examination?
   Yes
   No

Q41. Do you have a permanent timeslot in your schedule for attending meeting-type training?
   Yes
   No

Q42. How many hours of meeting-type training does your clinic provide in a week?

Q43. If you give meeting presentations, are you always allocated time for preparing the meeting presentations?
   Yes
   No

Q44. According to the new regulations, at least one year of training needs to be spent working at a university hospital and one year outside a university hospital. Would you find it appropriate if
   The entire specialty training took place at a university hospital
   3 months to 1 year of specialty training took place at a central hospital
   3 months to 1 year of specialty training took place at a university hospital
   Half of the specialty training took place at a central hospital and the other half at a university hospital
   The entire specialty training took place at a central hospital
   The specialty training took place somewhere else. Please specify why
Q45. Was your answer to the previous question mainly influenced by your
   Living/family situation
   Training
   Some other reason (please specify)
Q46. In my opinion, the length of the current 3-year long field-specific training is appropriate.
   Yes
   No
   If you answered ‘No’, what would you consider to be an appropriate length for the field-specific training?
Q47. The current length of surgical foundation training, 2 years and 3 months, is appropriate considering the emergency and general surgical skills required by the profession.
   Yes
   No
   If you answered ‘No’, what would you consider to be an appropriate length for the foundation training?
Q48. What things can only be learnt at a university hospital?
Q49. In your opinion, is the current examination the best method for testing learning outcomes or should other potential methods be considered for assessing the ability of working as a medical specialist?
   The current examination is the best method
   The current examination could be developed in the following manner / the examination could be replaced by:
Q50. If you answered ‘The current examination is the best method’, should the examination in your opinion be taken in smaller sections as the training progresses?
   Yes
   No
Q51. Did the physician’s foundation training provide you with sufficient skills to begin your specialty training in orthopaedics?
   Yes
   No
   If you answered ‘No’, please specify
Q52. Does your clinic have research projects in which a specialising physician can take part?
   Yes
   No
   Do the persons conducting research have sufficient supervision during research projects?
Q53. Does the university provide subject-appropriate researcher training?
   Yes
   No
Q54. Are you involved in a research project?
   Yes
   No
Q55. If you are conducting research, have you been granted paid leave for scientific work?
   From VTR (EVO) funding
   From elsewhere
Q56. If you are conducting research, have you been granted research leave in general?
   Yes
   No
Q57. Does your clinic have good opportunities for conducting research?
Q58. Are you working on a doctorate?
   Yes
   No
   I have a doctorate
   If you have a doctorate, does it affect your salary?
Q59. How many academic articles have you published?
   (written independently or co-written)
Q60. Relative strain in doctors (very minor, minor, reasonable, major, significant)
   How strained are you feeling?
   How strained are the other specialising physicians at your clinic?
   How strained are the specialists at your clinic?
Q61. The main factors contributing to the feeling of being strained (name three)
Q62. The main factors contributing to well-being at work (name three)
Q63. How collegial is the atmosphere at your clinic?
Q64. Are considering specialising in something else?
   No
   Yes
   If you answered ‘Yes’, please specify why and mention which specialty you are considering
Q65. Compared to my current experiences, when I initially applied to specialise in orthopaedics and traumatology, I expected it to be:
   Heavier
   Similar
   Less heavy
Q66. In your opinion, which criteria should be prioritised when choosing someone for a specialisation position?
   Please rank the following in order of importance. (1=most important, 5=least important)
   Community health centre service completed
   Introductory training completed
   Scientific research merits/doctoral dissertation
   Previous experience in orthopaedics at one’s own clinic
   Previous experience in orthopaedics at another hospital
   Recommendations
Q67. How would you rate your clinic’s orientation arrangements?
Q68. For how many months is each of the following placements carried out at a university hospital during specialty training? (0, 1–2, 3–4, over 4)

- Shoulder orthopaedics
- Knee orthopaedics
- Foot orthopaedics
- Back orthopaedics
- Endoprosthesis orthopaedics
- Traumatology
- Tumour orthopaedics
- Paediatric orthopaedics
- Rheumatic orthopaedics

Q69. How would you rate your opportunities of working at the following special clinics? (Very poor, poor, good, very good)

- Traumatology
- Endoprosthesis orthopaedics
- Leg orthopaedics
- Knee joint orthopaedics
- Shoulder joint orthopaedics
- Back orthopaedics
- Tumour orthopaedics
- Paediatric orthopaedics
- Rheumatic orthopaedics

Q70. How would you rate your opportunities of exercising the following roles in practice? (Very poor, poor, good, very good)

- Working as a superior / group leader
- Working as an expert
- Getting acquainted with service chains and the role of your specialty in the health care system
- Working as a researcher
- Working as a supervisor/trainer

Q71. The specialty programme of my university hospital includes a common, structured rotation through the various sub-specialties

- Yes
- No
- I do not know

Q72. Select the most appropriate answer

- Are you satisfied with your placements at the clinic during your specialty training?
- How would you rate your opportunities of influencing your placements?

Q73. How would you describe the situation regarding office space for doctors at your hospital? (You can select several options)

- Each specialist has their own personal workstation
- Specialists have several shared offices with shared workstations (some doctors may have their own personal workstation)
- None of the specialists has their own personal workstation (everyone uses the shared workstations in the offices)

Q74. Does your university hospital have shared spaces for orthopaedists? (e.g. orthopaedic library, recreation room etc.)

- Yes
- No

Q75. Number of traumatological operations at the hospital (none, provided assistance, performed an operation with assistance, performed an operation independently with an estimate of the number of independently performed operations)

- Lower leg fasciotomies
- Operative treatment of Achilles tendon rupture
- Treatment of hip fracture with a trochanteric nail
- Treatment of pertrochanteric fracture with a DHS
- Treatment of fracture of the femoral neck with total arthroplasty
- Treatment of fracture of the femoral neck with a prosthesis
- Screw fixation of fracture of the femoral neck, cannulated screws
- Intramedullary nailing of femur diaphysis fracture
- Laminofixation of femur diaphysis fracture
- Operative treatment of patella fracture
- Intramedullary nailing of leg fracture
- Laminofixation of leg fracture (distal/proximal)
- Initial treatment of complex lower limb fracture with external fixation
- Operative treatment of ankle fracture
- Laminofixation of collarbone fracture
- Operative treatment of proximal humerus fracture
- Reposition of shoulder luxation
- Fixation of olecranon fracture with tension band/plate
- Operative treatment of antebrachium fracture
- Treatment of wrist fracture with external fixation
- Treatment of wrist fracture with laminofixation
- Closed repositioning of wrist fracture + casting
- Operative treatment of a simple finger/MC fracture
- Saturation of finger extensor
- Finger amputation
- Below- and above-knee amputation
- Operative treatment of vertebral fracture
- External fixation of hip fracture
Laminofixation/screw fixation of hip fracture
Laminofixation of acetabulum fracture
Initial treatment of a multitrauma patient
Repeat operation of nonunion
Revision surgery of infected osteosynthesis/fracture
Working as a trauma leader
Trauma ward rounds + responsibility for the ward

**Q76. Number of orthopaedic procedures at the hospital**

*(none, provided assistance, operated with assistance, operated independently and an estimate of the number of independent operations)*

- Hallux valgus surgery (Chevron)
- Hallux valgus, proximal procedure (TMT arthrodesis, osteotomy)
- MTP I arthrodesis
- Trochlear resection
- FDL transposition
- Correction of pes planovalgus
- Knee arthroscopy + simple procedure (meniscal procedure, Staedmann)
- Knee cruciate ligament / collateral ligament surgery with graft
- Patella instability surgery, MPFL reconstruction
- Arthroscopic lavage for purulent arthritis of the knee
- Knee TEP
- Hip TEP
- Surgical treatment of prosthesis infection
- Hip revision arthroplasty
- Knee revision arthroplasty
- Dorsal prolapse surgery
- Dorsal stenosis surgery
- Instrumented spondylodesis
- Mobilisation of the shoulder in narcosis
- Shoulder endoscopy, decompression
- Corrective surgery of rotator cuff
- Corrective instability surgery of the shoulder joint (Bankart/Latarjet)
- Carpal canal discision
- Ankle arthroscopy
- Ankle arthrodesis (TC, subtalo)
- Hip arthroscopy/labrum correction
- Removal of osteosynthesis material
- Rounds at elective inpatient ward

**Q77. How would you rate the teaching of the following topics at your clinic? (Very poor, poor, good, very good)**

- Demanding assessments and statements
- Making a decision on starting expensive treatment
- Giving a meeting presentation
- Preparing a presentation for a lay audience (patients, policy-makers)

**Q78. Have you had the opportunity to utilise literature free of charge while conducting research during your specialty training?**

- Yes
- No

**Q79. Comprehensiveness of library services (very poor, poor, good, very good)**

- Availability of e-books and textbooks
- Availability of key electronic publication series in orthopaedics
- Availability of electronic databases, such as UpToDate, Terveysportti etc.

**Q80. Select the most appropriate option (very poor, poor, good, very good)**

- Opportunity to utilise scientific literature in your clinical work
- Opportunity to regularly participate in the internal training of the clinic
- Opportunity to give meeting presentations
- Range of topics covered by the meeting presentations at the clinic with regard to your objectives
- Opportunity to attend regular training outside the establishment
- Opportunity to attend theoretical studies during work hours

**Q81. On how many days a year can you attend external training sessions?**

**Q82. Select the most appropriate option (very poor, poor, good, very good)**

- You employer’s financial support for external training (course fees, travel costs, per diems, pay)
- Your opportunities of attending training sessions abroad
- Advice on the use your clinic’s information systems
- Your opportunities to work as a superior
- Your opportunities to receive training in administration

**Q83. Management training (very poor, poor, good, very good)**

- Your opportunity to participate in management training

**Q84. How extensive is the management training provided to you (e.g. front-line manager)? (in ECTS credits)**

- 0–10
- 11–20
- 21–30
- over 30 ECTS

**Q85. Is the management training provided free of charge?**

- Yes
- No
- Partially (please specify)
Q86. Select the most appropriate option (very poor, poor, good, very good)

- Your possibility of attending pedagogical studies
- Your possibility of getting to instruct other specialising physicians
- Range of patient material with regard to the training
- Opportunities for senior consultations in your own specialty
- Opportunities for senior consultations in preparing statements
- Opportunities for senior consultations in other specialties
- Amount and quality of theoretical training provided to you at the clinic
- Comprehensiveness and quality of the practical training
- Learning environment at your clinic

Q87. Does your clinic have employee time tracking?

- Yes
- No

Q88. How many hours do you on average work overtime each week? (normal working hours 38.25 h/week)

Q89. Do you receive overtime compensation at your clinic?

- Yes, as overtime pay
- Yes, as extra leave
- No

Q90. On average, how many times a month do you work in emergency duty at the workplace?

Q91. On average, how many hours of sleep do you get while working in emergency duty at the workplace?

Q92. On average, how many times a month are you on emergency duty at the ward/operating room?

Q93. On average, how many times a month are you on divergent duty at the workplace? (Refers to being on duty at the workplace without being on emergency duty. In divergent duty, the amount of active work is low (approximately 20 to 40 %) and the pay correspondingly lower than in regular emergency duty)

Q94. On average, how many times a month are you on call-back duty?

Q95. Does your unit have enough emergency duty personnel during emergency duty hours?

- Yes
- No

Q96. Would you like to have fewer on-duty hours and a correspondingly smaller pay?

- Yes
- No

Q97. Would you like to have more on-duty hours and a correspondingly larger pay?

- Yes
- No

Q98. Would you prefer to have shorter on-duty shifts?

- Yes
- No

Q99. Name three of the best features of your clinic

Q100. What are the three biggest shortcomings at your clinic, and how would you fix them?

Q101. How likely would you recommend your training place to your friend or colleague? (0=very unlikely, 10=very likely)

Q102. If you have any comments, please write them here
### Supplement 2. Educational views

| Question                                                                 | n  | Mean (SD) | Missing |
|-------------------------------------------------------------------------|----|-----------|---------|
| Respondents                                                             |    |           |         |
| Answered all the questions                                              | 36 |           |         |
| Answered only the first question                                        | 3  |           |         |
| Age (years)                                                             | 35 | 35.5 (3.8)| 1       |
| Sex                                                                     |    |           |         |
| Male                                                                    | 23 |           |         |
| Female                                                                  | 13 |           |         |
| Current place of work                                                   |    |           |         |
| Helsinki University Hospital                                            | 9  |           |         |
| Turku University Hospital                                               | 7  |           |         |
| Tampere University Hospital                                            | 7  |           |         |
| Kuopio University Hospital                                             | 7  |           |         |
| Oulu University Hospital                                               | 6  |           |         |
| Education                                                               |    |           |         |
| Lic.Med.                                                                | 31 |           |         |
| D.Med.                                                                  | 4  |           |         |
| Docent                                                                  | 1  |           |         |
| Do you have a prior Specialist Degree in Medicine?                      |    |           |         |
| Yes                                                                     | 2  |           |         |
| No                                                                      | 34 |           |         |
| How many full years have you been in specialty training?                | 34 | 5 (1.1)   | 2       |
| After graduation, how long have you been working as a doctor in         |    |           |         |
| orthopaedics and traumatology (years)?                                  | 36 | 3.0 (1.6) |         |
| Of that time, how long at a regional hospital                           | 33 | 0.5 (0.9) |         |
| Of that time, how long at a central hospital                            | 35 | 1.3 (1.1) |         |
| Of that time, how long at a university hospital                         | 35 | 1.0 (0.9) |         |
| How long have you worked at your current workplace (years)?             | 36 | 1.5 (1.8) |         |
| Did you consider other specialties before choosing orthopaedics?        |    |           |         |
| Yes                                                                     | 20 |           |         |
| No                                                                      | 16 |           |         |
| After having completed your specialty training, are you going to primarily work | |         |         |
| As an orthopaedist at a public sector hospital or institution           | 36 |           |         |
| In administration in the public sector                                  | 0  |           |         |
| As a researcher or teacher                                             | 0  |           |         |
| As a self-employed person                                               | 0  |           |         |
| As an expert                                                            | 0  |           |         |
| Do you have or have you had a personal advisor or tutor?                |    |           |         |
| Yes, at the regional hospital                                          | 0  |           |         |
| Yes, at the central hospital                                           | 8  |           |         |
| Yes, at the university hospital                                         | 19 |           |         |
| I have had the same advisor/tutor throughout my specialty training      | 5  |           |         |
| I have not had an advisor/tutor at any stage                            | 4  |           |         |
| All specialty training should be                                        |    |           |         |
| Entirely at a university hospital                                       | 3  |           |         |
| 3 months – 1 year at central hospital                                   | 1  |           |         |
| 3 months – 1 year at university hospital                                | 4  |           |         |
| Half at a central hospital and the other half at a university hospital  | 28 |           |         |
| Entirely at a central hospital                                         | 0  |           |         |
| Reason for previous answer                                             |    |           |         |
| Living or family situation                                             | 1  |           |         |
| Training                                                                | 30 |           |         |
| Other: Versatility, quality and variety of education                    | 5  |           |         |
| Is the current exam the best method for testing your skills?            |    |           |         |
| Yes                                                                     | 21 |           |         |
| The current exam could be developed in the following manner:            |    |           |         |
| Oral test, multiple parts, assessment of clinical skills                | 14 |           |         |
| If the answer above is yes, should the examination be taken in smaller sections as the training progresses? | 6  |           |         |
| Yes                                                                     | 19 |           |         |
| No                                                                      | 11 |           |         |
| Are you involved in a research project?                                 |    |           |         |
| Yes                                                                     | 16 |           |         |
| No                                                                      | 19 |           |         |
| Are you working on a doctorate?                                        |    |           |         |
| Yes                                                                     | 11 |           |         |
| No                                                                      | 19 |           |         |
| I have a doctorate                                                     | 5  |           |         |
### Supplement 2. Continued

| Question                                                                 | n  | Mean (SD) | Missing |
|--------------------------------------------------------------------------|----|-----------|---------|
| How many academic articles have you published?                           | 25 | 4.3 (8.2) | 11      |
| How would you rate your opportunities of working at the following special clinics? (1 = very poor, 4 = very good) |    |           |         |
| Traumatology                                                             | 3.4|           | 3       |
| Endoprostheses orthopaedics                                             | 3.3|           | 3       |
| Leg orthopaedics / podiatry                                              | 3.0|           | 6       |
| Knee joint orthopaedics                                                 | 2.9|           | 6       |
| Shoulder joint orthopaedics                                             | 2.7|           | 5       |
| Spine                                                                    | 3.3|           | 4       |
| Tumour orthopaedics                                                     | 2.2|           | 6       |
| Pediatric orthopaedics                                                  | 2.2|           | 5       |
| Rheumatic orthopaedics                                                  | 2.1|           | 6       |
| How many hours do you on average work overtime each week?                | 33 | 4.6 (3.5) | 3       |
| How many times a month do you work in emergency duty?                   | 33 | 3.5 (0.8) | 3       |
| How many times a month are you on emergency duty at the ward or operating room? | 32 | 1.2 (0.8) | 4       |
| How many times a month are you on on-call duty?                         | 36 | 0.8 (1.2) |         |
| How many hours of meeting-type training does your clinic provide in a week? | 36 | 2.8 (1.8) |         |
Supplement 3A. Proportion (%) of specializing physicians who have performed or provided assistance in traumatological procedures and the amount of independently performed procedures

| Traumatological procedure                                      | Operated independently (%) | Operated with assistance (%) | Provided assistance (%) | None (%) | Operations done independently mean (SD) | Missing answers (n) |
|---------------------------------------------------------------|----------------------------|------------------------------|-------------------------|----------|----------------------------------------|--------------------|
| **Upper limb**                                                |                            |                              |                         |          |                                        |                    |
| Reposition of shoulder luxation                               | 97                         | 3                            | 0                       | 0        | 25 (15)                                |                    |
| Plate fixation of collarbone fracture                         | 88                         | 9                            | 0                       | 3        | 6.8 (5.2)                              |                    |
| Operative treatment of proximal humerus fracture               | 30                         | 49                           | 18                      | 3        | 6.3 (7.2)                              |                    |
| Fixation of olecranon fracture with tension band/plate        | 91                         | 3                            | 3                       | 3        | 14 (9.8)                               |                    |
| Operative treatment of antebrachium fracture                   | 82                         | 12                           | 6                       | 0        | 5.7 (7.6)                              |                    |
| Operative treatment of wrist fracture with external fixation  | 21                         | 18                           | 15                      | 46       | 3.2 (3.5)                              |                    |
| Operative treatment of wrist fracture with plate fixation     | 91                         | 9                            | 0                       | 0        | 15 (9.0)                               |                    |
| Closed repositioning of wrist fracture + casting              | 97                         | 3                            | 0                       | 0        | 62 (31)                                |                    |
| Operative treatment of a simple finger or metacarpal fracture  | 67                         | 21                           | 0                       | 12       | 6.8 (5.9)                              |                    |
| Suturing of finger extensor tendon                            | 73                         | 9                            | 3                       | 15       | 4.0 (3.3)                              |                    |
| Finger amputation                                             | 91                         | 3                            | 0                       | 6        | 11 (11)                                |                    |
| **Hip, pelvis, and acetabulum**                               |                            |                              |                         |          |                                        |                    |
| Operative treatment of hip fracture with trochanteric nail    | 100                        | 0                            | 0                       | 0        | 36 (26)                                |                    |
| Operative treatment of pertrochanteric fracture with a DHS    | 76                         | 18                           | 3                       | 3        | 8.0 (6.6)                              |                    |
| Operative treatment of fracture of the femoral neck with total arthroplasty | 36                         | 33                           | 24                      | 6        | 5.5 (7.5)                              |                    |
| a semi-endoprosthesis                                         | 100                        | 0                            | 0                       | 0        | 47 (35)                                |                    |
| Screw fixation of fracture of the femoral neck, cannulated screws | 73                         | 18                           | 6                       | 3        | 6.6 (5.2)                              |                    |
| Intramedullary nailing of femur diaphysis fracture            | 67                         | 27                           | 6                       | 0        | 7.4 (6.8)                              |                    |
| Plate fixation of femur diaphysis fracture                    | 55                         | 33                           | 9                       | 3        | 7.4 (6.7)                              |                    |
| External fixation of hip fracture                             | 9                          | 12                           | 21                      | 58       | 1.0 (1.0)                              |                    |
| Plate fixation/screw fixation of hip fracture                 | 3                          | 18                           | 76                      | 3        | 1.3 (0.6)                              |                    |
| Plate fixation of acetabulum fracture                         | 3                          | 12                           | 64                      | 21       | 2.0 (0.0)                              |                    |
| **Lower limb**                                                |                            |                              |                         |          |                                        |                    |
| Operative treatment of Achilles tendon rupture                | 49                         | 30                           | 15                      | 6        | 3.2 (0.9)                              |                    |
| Lower leg fasciotomies                                        | 64                         | 24                           | 6                       | 6        | 3.5 (4.4)                              |                    |
| Intramedullary nailing of leg fracture                        | 69                         | 28                           | 0                       | 3        | 8.5 (8.2)                              | 1                  |
| Plate fixation of leg fracture (distal/proximal)              | 42                         | 42                           | 15                      | 0        | 4.8 (4.0)                              |                    |
| Initial treatment of complex lower limb fracture with external fixation | 82                         | 3                            | 6                       | 9        | 6.1 (4.6)                              |                    |
| Operative treatment of ankle fracture                         | 100                        | 0                            | 0                       | 0        | 42 (29)                                |                    |
| Operative treatment of patella fracture                       | 81                         | 10                           | 7                       | 3        | 6.6 (4.6)                              | 2                  |
| Below- and above-knee amputation                              | 91                         | 3                            | 0                       | 6        | 18 (12)                                | 1                  |
| **Spine**                                                     |                            |                              |                         |          |                                        |                    |
| Operative treatment of vertebral fracture                     | 21                         | 27                           | 46                      | 6        | 17 (20)                                |                    |
| **Other**                                                     |                            |                              |                         |          |                                        |                    |
| Initial treatment of a multi-trauma patient                   | 85                         | 9                            | 6                       | 0        | 31 (35)                                |                    |
| Repeat operation of nonunion                                  | 27                         | 33                           | 39                      | 0        | 5.6 (3.4)                              |                    |
| Revision surgery of infected osteosynthesis fracture           | 75                         | 13                           | 9                       | 3        | 12 (12)                                | 1                  |
| Working as a trauma leader                                    | 88                         | 0                            | 6                       | 6        | 31 (34)                                |                    |
| Trauma ward rounds + responsibility for the ward              | 91                         | 3                            | 3                       | 3        | 42 (42)                                | 1                  |

DHS = Dynamic hip screw
### Supplement 3B. Proportion (%) of specializing physicians who have performed or provided assistance in orthopedic procedures and the amount of independently performed procedures

| Orthopedic procedure | Operated independently (%) | Operated with assistance (%) | Provided assistance (%) | None (%) | Operations done independently mean (SD) | Missing answers (n) |
|----------------------|-----------------------------|----------------------------|-------------------------|----------|----------------------------------------|---------------------|
| **Upper limb**       |                             |                            |                         |          |                                        |                     |
| Mobilization of the shoulder under narcosis | 18                          | 18                         | 18                      | 46       | 2.0 (1.4)                              |                     |
| Shoulder endoscopy, decompression | 24                          | 58                         | 15                      | 3        | 14 (33)                               |                     |
| Operative treatment of rotator cuff rupture | 13                          | 31                         | 53                      | 3        | 10 (17)                               | 1                   |
| Operative treatment of instability of shoulder joint (Bankart or Latarjet) | 0                           | 9                          | 82                      | 9        | 0                                      |                     |
| Carpal canal release | 91                          | 3                          | 0                       | 6        | 67 (40)                               |                     |
| **Hip, pelvis, and acetabulum** |                             |                            |                         |          |                                        |                     |
| Hip arthroplasty    | 30                          | 58                         | 12                      | 0        | 14 (11)                               |                     |
| Hip revision arthroplasty | 3                           | 18                         | 76                      | 3        | 2.0 (1.4)                              |                     |
| Hip arthroscopy and/or labrum correction | 0                           | 6                          | 49                      | 46       | 0                                      |                     |
| **Lower limb**       |                             |                            |                         |          |                                        |                     |
| Knee arthroscopy and simple procedure (meniscal procedure, Staedmann) | 85                          | 9                          | 0                       | 6        | 20 (23)                               |                     |
| Operative treatment of knee cruciate ligament or collateral ligament with a graft | 0                           | 33                         | 61                      | 6        | 0                                      |                     |
| Patellar instability surgery, MPFL reconstruction | 3                           | 27                         | 64                      | 6        | 3.8 (2.2)                              |                     |
| Arthroscopic lavage for purulent arthritis of the knee | 73                          | 9                          | 12                      | 6        | 3.6 (2.1)                              |                     |
| Knee arthroplasty    | 31                          | 63                         | 6                       | 0        | 19 (20)                               | 1                   |
| Knee revision arthroplasty | 0                           | 12                         | 85                      | 3        | 0                                      |                     |
| Ankle arthroplasty   | 0                           | 19                         | 63                      | 19       | 0                                      | 1                   |
| Ankle arthrodesis (TC, subtalar) | 0                           | 9                          | 73                      | 18       | 0                                      |                     |
| Hallux valgus surgery (Chevron) | 64                          | 6                          | 6                       | 24       | 7.2 (5.4)                              |                     |
| Hallux valgus, proximal procedure (TMT arthrodesis, osteotomy) | 27                          | 12                         | 33                      | 27       | 4.4 (3.3)                              |                     |
| MTP I arthrodesis    | 76                          | 12                         | 3                       | 9        | 14 (11)                               |                     |
| Trochlear resection  | 61                          | 9                          | 15                      | 15       | 9.0 (6.9)                              |                     |
| FDL transposition    | 36                          | 15                         | 33                      | 15       | 5.8 (5.8)                              |                     |
| Correction of pes plano valgus | 0                           | 6                          | 64                      | 30       | 0                                      |                     |
| **Spine**            |                             |                            |                         |          |                                        |                     |
| Dorsal prolapse surgery | 27                          | 55                         | 15                      | 3        | 5.6 (3.9)                              |                     |
| Dorsal stenosis surgery | 12                          | 49                         | 36                      | 3        | 8.0 (6.5)                              |                     |
| Instrumented spondylodesis | 3                           | 33                         | 61                      | 3        | 5.7 (4.0)                              |                     |
| **Other**            |                             |                            |                         |          |                                        |                     |
| Removal of osteosynthesis material | 94                          | 3                          | 3                       | 0        | 37 (22)                               |                     |
| Surgical treatment of prostheses infection | 50                          | 28                         | 19                      | 3        | 7.6 (5.7)                              | 1                   |
| Rounds on elective inpatient ward | 91                          | 6                          | 3                       | 0        | 76 (86)                               |                     |

MPFL = medial patellofemoral ligament; TC = talocalcaneal; TMT = tarsometarsal; MTP = metatarsophalangeal; FDL = flexor digitorum longus.