

Postgraduate Anesthesiology Training: A Comparison of the American and Norwegian Models

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Acknowledgments

I have been very fortunate with the opportunities I have been given during my education and career. I studied medicine in Germany and have received my resident training in Norway at the Central Hospital in Stavanger and the University Hospital in Oslo (Rikshospitalet). I then was given the opportunity to work as a “clinical instructor” for a two-year period at the Stanford Anesthesia Department (1). This was an attending position which combined working alone and together with residents and fellows in a teaching context.

During this time I benefitted greatly from the different forms of education and training in Norway and in the United States. The differences I found in the forms of training and also professional culture motivated me to write this thesis. Many people have directly or indirectly helped me with conducting this research and I am very grateful to them.

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1 Introduction

In the last two decades the field of anesthesiology has undergone major changes driven by different kinds of influences. The advancements in technology followed by sub-specialization have given the possibility to treat increasingly complex surgical patients. Furthermore the development of the field of anesthesiology in the different countries in the world is challenged by the following aims of the respective national healthcare system: improving the experience of care, improving the health of the population, and reducing per capita costs of health care (2). One up-to-date example of these aims affecting the field of anesthesiology is the expansion of the role of the anesthesiologist from being responsible for the patient only during operations to being responsible for the patient throughout the continuum of perioperative care (3).

In order to prepare anesthesia residents to the challenges of the future, resident education has to adapt continuously. Here it is possible to learn from anesthesia education systems in other countries.

The aim of this thesis is to compare two systems of anesthesia resident education with the example of the United States and Norway and to identify the strengths and weaknesses of the two systems.

Furthermore, the Norwegian education system for specialization of doctors is currently undergoing a major transformation (4). This thesis will also explore the aims of the updated version (Section 2.3, the new anesthesia specialization system in Norway) and compare it as well to the existing model in the US. The rollout for the new regulations is scheduled for September 2017.

In order to compare and better understand the two systems we conducted a literature review. Based on the review we designed and distributed a questionnaire directed to anesthesiologists who were recently board certified (between January 2015 or will be until December 2017) either in the US and Norway in order to gain insight into similarities and differences.

The discussion takes into account the results of the questionnaire combined with literature research.

2 Anesthesia education systems

2.1 The American anesthesia education system

The requirements for anesthesia education in the United States are compiled in the “American College of Graduate Medical Education (ACGME) Program Requirements for Graduate Medical Education in Anesthesiology” (5). All requirements are reviewed by the Review Committee for Anesthesiology (6).

There are the 7 subspecialty boards within anesthesia:

- Adult Cardiothoracic Anesthesiology
- Anesthesiology Critical Care Medicine
- Clinical Informatics
- Hospice and Palliative Medicine
- Obstetric Anesthesiology
- Pain Medicine
- Pediatric Anesthesiology

All of the listed subspecialties have their own program requirement documents (7–13), effective as of July 1, 2016 (14).

Applicants are required to submit an application form created by the Review Committee for Anesthesiology (6). This application form has several sections:

- **FUNDAMENTAL CLINICAL SKILLS**
- CA-1 through CA-3 Years
- **SPONSORING INSTITUTION**
- **PROGRAM PERSONNEL AND RESOURCES**
 - Program Director
 - Faculty
 - Resources
- **EDUCATIONAL PROGRAM**
 - Didactic Sessions

- Patient Care
- Medical Knowledge
- Practice-based Learning and Improvement
- Interpersonal and Communication Skills
- Professionalism
- Systems-based Practice
- Curriculum Organization and Resident Experiences

Resident programs have to fulfill specific educational requirements listed under the above categories.

The following is an extract from the ACGME Program Requirements for Graduate Medical Education in Anesthesiology (15).

“One of the core tenets of the American Medical education is - graded and progressive responsibility - of residents.

The educational programs in anesthesiology are configured in 36-month and 48-month formats of which 12 months of education are in fundamental clinical skills of medicine, and both include 36 months of education in clinical anesthesia (CA-1, CA-2, and CA-3 years).

12 months of the resident’s educational program must provide broad education in fundamental clinical skills of medicine relevant to the practice of anesthesiology.

At least six months of fundamental clinical skills of medicine education must include experience in caring for inpatients in family medicine, internal medicine, neurology, obstetrics and gynecology, pediatrics, surgery or any of the surgical specialties, or any combination of these.

During the first 12 months of the program, there must be at least one month, but not more than two month(s) each of critical care and emergency medicine.

Thirty-six months of education must be in perioperative medicine. This must include experience with a wide spectrum of disease processes and surgical procedures available within the CA-1

through CA-3 years to provide each resident with broad exposure to different types of anesthetic management.

Resident education must include a minimum of four months of critical care medicine.

Resident education must include a minimum of two one-month rotations each in obstetric anesthesia, pediatric anesthesia, neuroanesthesia, and cardiothoracic anesthesia.

Resident education must include a minimum of three months in pain medicine.

Residents must have at least two weeks of experience managing the anesthetic care of patients undergoing diagnostic or therapeutic procedures outside of the surgical suite.

All residents must obtain advanced cardiac life support (ACLS) certification at least once during the program.

The curriculum must advance residents' knowledge of the basic principles of research, including how research is conducted, evaluated, explained to patients, and applied to patient care.

In the clinical learning environment, each patient must have an identifiable, appropriately-credentialed and privileged attending physician (or licensed independent practitioner as approved by each Review Committee) who is ultimately responsible for that patient's care.

Duty hours must be limited to 80 hours per week, averaged over a four-week period, inclusive of all in-house call activities and all moonlighting" (5).

2.1.1 Stanford University Hospital

Stanford University Hospital was selected for the US-American survey. Stanford University is a top-ranked institution in the United States (16), and the medical education at Stanford University Hospital is of high international reputation. The clinic can be considered a best-practices representative of US-American medical training institutions.

History: *"Stanford University was founded by Leland Stanford a leader of the Republican Party, governor of California and later U.S. senator, in memoriam of his son, who died at the age of 15 of*

typhoid fever” (17). “After his death, his wife Jane after selling her railroad holdings, turned over \$11 million to the university trustees” (18). “After that, the University survived an earthquake on April 18 1906, World War I, and opened professional schools of medicine, business, engineering, education and law in the following years. Stanford alumni were deeply involved in creating what is called Silicon valley and founded world known companies like Cisco Systems, Hewlett Packard Company, Intuit, Silicon Graphics, and Sun Microsystems and Google” (19).

“Stanford Health Care, previously known as Stanford Hospital & Clinics, and Lucile Packard Children's Hospital Stanford, are nonprofit California corporations” (20). “It is one of its principles, that Stanford Medicine is comprised of entities that are strategically, operationally and financially interdependent.” (21).

The ANNUAL DISCLOSURE REPORT OF STANFORD HEALTH CARE (22) gives information on how patient service revenue is divided.

Sources of Gross Patient Service Revenue		
	Fiscal Year Ended August 31,	
	2014	2013
Medicare	34%	34%
Medi-Cal	4	4
Managed Care – Capitation	-	-
Managed Care – Discounted Fee for Services	54	53
Indemnity Insurance, Self-Pay, Other	8	9
Total	<u>100%</u>	<u>100%</u>

Extract from: ANNUAL DISCLOSURE REPORT OF STANFORD HEALTH CARE (22)

“Stanford’s financial position remains strong. Consolidated FY2015 financial results benefited from solid investment performance, strong health care services revenues, and continued generous donor and community support,” said Randy Livingston, vice president for business affairs and chief financial officer (23).

This statement elucidates how Stanford University financials are composed.

1. Context of Stanford Hospital, mostly financed from the private sector

2. Medicare and Medicaid, in California called Medi-Cal

“Medicare is a single-payer, national social insurance program administered by the US federal government since 1966, currently using about 30–50 private insurance companies across the United States under contract for administration” (24). *“Medicaid in the United States is a social health care program for families and individuals with limited resources”* (25). These two programs are the most similar to the Norwegian healthcare system, wherein all hospitals are funded by the public as part of the national budget (26). As one can see in the extract above, Medicare and Medicaid together only cover 38% of gross service patient revenue. The major source of revenue comes from managed care - discounted fee for service, paid out of the pocket - private insurance.

2.1.2 Stanford Anesthesiology Department

“The Stanford Anesthesiology Department is a university-based program with 70 full-time equivalent (FTE) faculty members and 72 residents in training and with an annual research budget of approximately \$6,500,000 in 2011” (27). It compares in size and function in Norway to Rikshospitalet (which is a part of University Hospital in Oslo) in the number of staff but not in research budget, which is lower at Rikshospitalet.

2.1.3 Research during residency in the US

In their review article “Anesthesiology and the academic medical center: place and promise at the start of the new millennium” Reeves and Greene suggest that *“without research the profession of anesthesiology is in danger of becoming a trade union. However, to conduct meaningful research that is capable of generating funding, investigators require substantive training in research methodology”* (28). In an editorial from 1975, Kitz and Biebuyck have stated that *“teaching and training when not continually enriched by the leaven of research become flat and unimaginative, and eventually, fixed in outmoded concepts”* (29). In a survey done by Ahmad et al., thirty-two percent of programs in the US had a structured resident research education program and he concluded that structured residency research programs are associated with higher resident research productivity (30). Some anesthesiology educators in the United States have advocated for an integrated research experience in the resident curriculum and spread over Clinical Anesthesia year 1 through Clinical Anesthesia year 3 of training (31). *“The Accreditation Council for Graduate Medical Education (ACGME) requires accredited U.S. anesthesiology programs to facilitate*

scholarly activity during residency training, but the guidelines are not well defined and are open to individual interpretation of the program chair and residency program director” (30).

2.1.4 Working hours of anesthesia residents in the US

At the website of Anesthesiology Residency Program at University of Rochester one can read about a typical day in the life of a resident (32). An average day involves getting up in the morning between 4:30 am and 5:30 am and working until 5-8 pm depending whether the resident is on-call or not. Usually anesthesia residents get a 10-15 minute coffee break in the morning and 30 minutes of lunch break. The first teaching session usually starts at 6:30-7:00 am before the first patient is brought into the operating room (OR).

In 2001, ACGME enacted duty hour restrictions, since duty hour requirements of 80-100 hours a week influenced specialty choice away from the specialty of anesthesia (33). Working hours for residents before 2001 were even higher than the working schedule described above.

In Norway the first patient is typically taken into the OR at 8:00 am, and anesthesiology trainees (and specialists) typically start work at 7:30 am. Residents usually conclude their workday at 4:00 pm if they are not on-call. Working hours for doctors in Norway have actually gone down in the past decade (34).

2.2 The Norwegian education system

In Norway the Norwegian Directorate of Health is responsible for the accreditation of specialists in anesthesia (35). The description of anesthesia specialization training can be read and downloaded from the website of the Norwegian Medical Association (36).

In Norway the specialty of anesthesia is built on 4 pillars: anesthesia, intensive care, acute care medicine and pain management (36). The goal of the specialization is to acquire the necessary practical skills, knowledge and attitude to be capable of working as an independent attending afterwards (36). The resident is expected to participate in the department's clinical activity, teaching, research, interdisciplinary collaboration and patient management, as well as continuous development of the field (36).

Specialist training in anesthesiology is of 5 years duration. Four of these years must be within a recognized anesthesia department. The remaining year may consist of either 6 months of research and/or clinical work within pediatrics or internal medicine or a health administrative position. During the 4th year of clinical anesthesia the resident is required to participate fully in on-call responsibilities. Additionally, the resident must also attend 210 hours of obligatory courses and 38 hours of elective courses relevant for anesthesiologists that are approved by the specialist committee in anesthesiology (37).

The description of objectives in anesthesia specialization (36) lists in detail the educational goals and requirements within the four subdivisions of anesthesia.

Moreover, in order to receive the attestation of anesthesia specialization the resident must provide 3 documents. First the "Standardattest" which is signed by the chief of the department of anesthesia and confirms that the resident fulfilled his or her duties in a satisfactory manner. Second, attestations of completed required elective courses must be provided. Thirdly a checklist with fulfilled procedures must be provided.

There is the possibility to take the European Diploma in Anesthesiology (38), but it is not mandatory (36).

2.3 The new anesthesia specialization system after March 2017

In 2011, the Ministry of Health gave the Directorate of Health the task of looking at physician specialization with a goal of making it sustainable for the future needs of healthcare (39).

There are some obvious challenges within the future health care system (that are not necessarily exclusive to Norway). The proportion of citizens over 67 years will increase by 64% and those over 80 will increase by 56% until 2030 (39). With knowledge of current health care consumption, we know that seniors over 70 have a five times higher consumption of hospital services than younger age groups indicating that the demands of the healthcare system are expected to increase significantly (39).

Furthermore, while changes in disease development may not pose any acute challenges, they will eventually have an impact on the demand for both general and specialized expertise.

Moreover, increases in obesity, lung disease (COPD, asthma), allergies, anxiety and depression are expected in the near future (39). For the growing immigrant populations with non-Norwegian ethnicity, the prevalence of some diseases is higher than among ethnic Norwegians, which will require changes in skills and expertise required to adequately care for this population (39).

In addition to changes in patient and illness demographics, healthcare staffing changes are also expected and of concern. Worryingly low staff numbers are anticipated in geriatrics, genetics, nuclear medicine, hematology and immunology. The age profile among midwives, psychiatric nurses and public health nurses are so skewed that a significant shortfall in number of these healthcare providers is expected in the coming years (39).

The new education systems is designed to meet the challenges imposed by the above predictions.

The concrete goal of the new regulations concerning resident education is to increase focus on what skills and knowledge doctors undergoing specialization have actually acquired rather than focusing on registering the number of procedures and specific length of service.

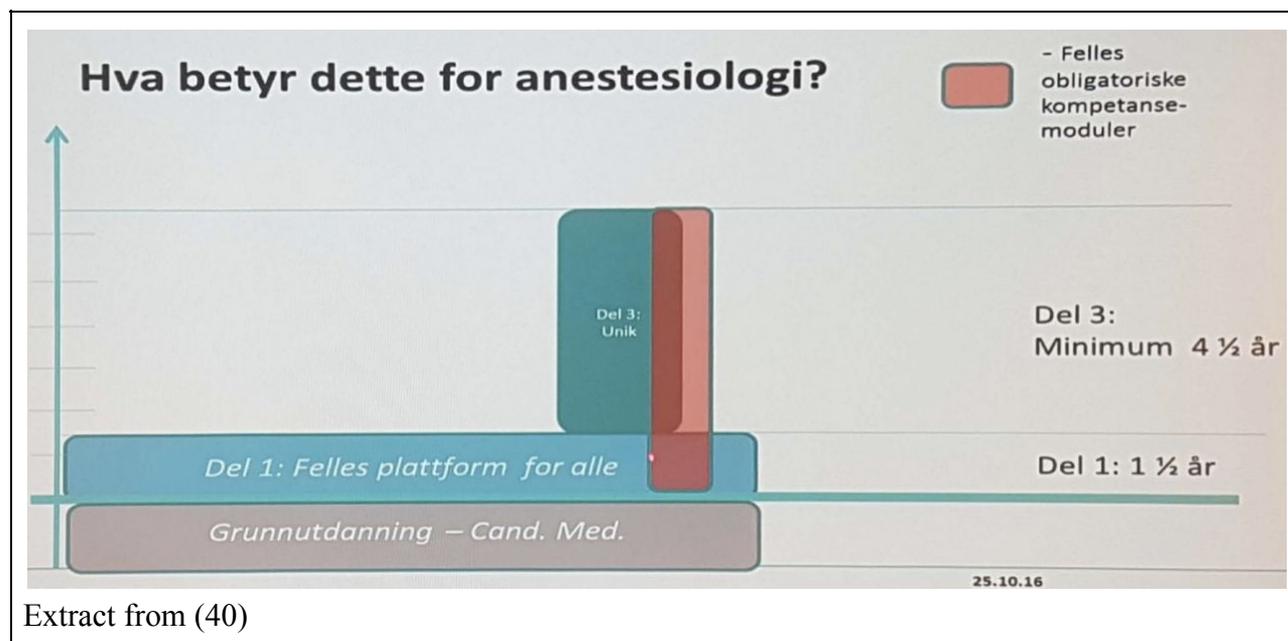
The new specialization system is divided into 3 parts:

Part 1 is common to all, it will replace “turnustjeneste”. It consists of one year in hospital and a half year in municipal health services. Today's “turnustjeneste” ceases.

Part 2 is common knowledge platforms for groups of specialties, ie surgical and internal medicine.

Part 3 is unique to each specialty. The specialties that do not have Part 2 run directly from part 1 to part 3. It introduced mandatory topics of ethics, communication, user intervention, education of patients and their families, health knowledge, research understanding and knowledge management, quality and patient safety, regulation, coordination, management and organization. These topics spanning the entire education system and has the description “joint competence modules”.

For anesthesiology it will look like this:



As the picture shows, the specialty of anesthesia will consist of a part 1 (Del 1: Felles plattform for alle) but no part 2 (Del 2), meaning residents directly proceed to part 3 (Del 3).

2.3.1 Suggested method for competency assessment

Since the new anesthesia specialization system is not in place yet there are suggestions how competency can be assessed (41).

1. In-hospital teaching
2. Literature search
3. Evaluation by attending
4. Structured observation with approval test (written, oral)
5. Logbook
6. Clinical service under supervision and guidance, incl. on-call duty
7. Mandatory courses

2.3.2 Suggested mandatory learning activities

1. Procedures in accordance with curriculum requirements
2. Simulation
3. Courses
4. Literature search
5. E-Learning
6. Ultrasound course
7. Research-based knowledge
8. Annual simulations and team training including neonatal resuscitation
9. Participation in training in newborn reanimation under training

2.4 Table with summary of the two (three) systems

In order to get a better overview of similarities and differences of the two (three) systems, some points of interest are categorized in the following table.

Category	American system (5)	Norwegian today (36)	Norwegian new (41)
Aim to educate independent practitioner	Yes	Yes	Yes

Concept: graded and progressive responsibility of residents	Yes	Yes	Yes
Supervision during residency	100%	~50%	~50%
Leadership education as part of the residency program	Yes	Yes	Yes
Definition of the anaesthesia education systems	Practice of medicine dealing with the perioperative management of patients.	Anesthesiology is a medical specialty with four main areas: anesthesia, intensive care medicine, emergency medicine and pain management.	The specialty of anesthesiology divided into four main areas / 'columns' consisting of; anesthesia and perioperative medicine, intensive care medicine, pain management, and emergency and prehospital medicine.
Length of residency program	4 years: The educational programmes in anesthesia are configured in 36 months and 48 months formats. The latter includes 12 months of education in fundamentals clinical skills of medicine, and both include 36 months of education and clinical anaesthesia in (CA-1, CA-2, and CA-3 years).	5 years:	6 years: Part 1 is common to all, they will replace the “turnustjeneste”. It consists of one year in hospital and a half year in municipal health services. Today’s “turnustjeneste” ceases. Part 2 is common knowledge platforms for groups of subjects, ie surgical and internal medicine. Part 3 is unique to each specialty. The specialties that do not have Part 2 run

			directly from part 1 to part 3.
Existence of program letter of agreement (PLA)	Yes	No	No
Identification of resident supervisor	Yes	Yes	Yes
Existence of case log data	Yes	Yes	Yes
Scientific education as part of residency	Yes	Yes	Yes
Quarterly written performance evaluation	Yes	No	Maybe, not decided yet
Existence of experience logs	Yes	No	Maybe, not decided yet
Existence of subspecialties of anaesthesia: critical care, obstetric anaesthesia, pediatric anaesthesia, neuroanaesthesia, cardiothoracic anaesthesia, and pain medicine and also in research	Yes	Yes	Yes
Size of the residency program	Minimum of 9 residents Appointed each to CA-1, CA-2 and CA-3 years	No requirement	No requirement
Existence of recommended mandatory courses	No	Yes	Yes
Document facta			
Scale of the document	35 pages,	15 pages	54 pages
Existence of program	Yes	No	No

personnel and resources chapter			
Patient Care and Procedural Skills			
Competency-based goals	Yes	No	Yes
Communication skill requirements	Yes	Yes	Yes
Resident education must include a minimum of four months of critical care medicine	Yes	Yes	Yes
Resident education must include a minimum of two one-month rotations each in obstetric anesthesia, pediatric anesthesia, neuroanesthesia, and cardiothoracic anesthesia.	Yes	Yes	Yes
Resident education must include a minimum of three months in pain medicine	Yes	Yes	Yes
Evaluation system			
Existence of a clinical competency committee	Yes, consisting of physician faculty members and Chief residents	Yes, consisting of physician faculty members and Chief residents	Yes, consisting of physician faculty members and Chief residents
Existence of summative evaluation for each resident	Yes	Yes	Yes
Participation in clinical quality improvement and patient safety programs required	Yes	No	Yes

In summary, one may observe that the new Norwegian anesthesia education system is moving closer to the current American model.

There are 3 additional points where the Norwegian system differs from the American:

1. In Norway an anesthesia attending only has to be available on short notice but does not have to be present during a case handled by the resident (36).
2. Emergency medicine is in Norway one “pillar” of anesthesia education while it is a specialty for itself in the US. The process of sub-specialization is in a more advanced state in the US. In the new education system in Norway, emergency medicine will also stand on it’s own feet as an independent specialty.
3. In the US critical care and emergency medicine is a part of learning fundamental skills, but it is not typically a part of daily routine work as an attending afterwards, as it often is in Norway.

3 Method and data selection

This section describes in detail how the survey was designed, i.e., how questions were selected and how the collected data was processed and evaluated.

3.1 Survey

Survey section topics were adapted from Tanaka et al. (42) in combination with two work-life balance questions, see full survey attached at the end of the thesis. The following are survey section topics with explanation (42).

Patient care

1. Preanesthetic evaluation, assessment, and preparation
2. Anesthetic plan and conduct
3. Periprocedural pain management
4. Management of perianesthetic complications
5. Crisis management
6. Triage and management of critically ill patient in nonoperative setting
7. Acute, chronic, and cancer-related pain consultation/management
8. Technical skills: airway management
9. Technical skills: use/ interpretation of monitoring and equipment
10. Technical skills: regional anesthesia

Medical knowledge

1. Knowledge (ABA) (43)

Professionalism

1. Responsibility to patients, families, and society
2. Honesty, integrity, and ethical behavior
3. Commitment to institution, department, and colleagues
4. Receiving and giving feedback

5. Responsibility for personal emotional, physical, and mental health

Interpersonal and communication skills

1. Communication with patients and families
2. Communication with other professionals
3. Team and leadership skills

Practice-based learning and improvement

1. Incorporation of quality improvement and patient safety initiatives into personal practice
2. Analysis of practice to identify areas in need of improvement
3. Self-directed learning
4. Education of patient, families, students, residents, and others

Systems-based practice

1. Coordination of patient care within the healthcare system
2. Patient safety and quality improvement

The survey instrument was developed by extracting questions when studying the American and Norwegian requirements and afterwards categorizing them under the section topics adapted from Tanaka (42). Google forms was used as an online survey tool (Alphabet Inc., Mountain View, CA) (44). The survey consisted of 18 questions organized by sections as shown in the attachment. Sections included questions regarding practical skills, theoretical skills, communication skills, work-life balance and research-, leadership-, quality improvement-competencies. The questions were formatted as linear scale (1= not at all; 10=very much so) or drop down choices. Three questions concerning practical skills were chosen in order to measure easy (Intubation with direct laryngoscopy), medium (Indirect laryngoscopy with videoscope) and advanced (Tracheotomy) procedure type skills.

No incentives were offered to participate. In order to determine survey question acceptability, understanding, and construct validity the survey questions were pilot-tested with an anesthesia

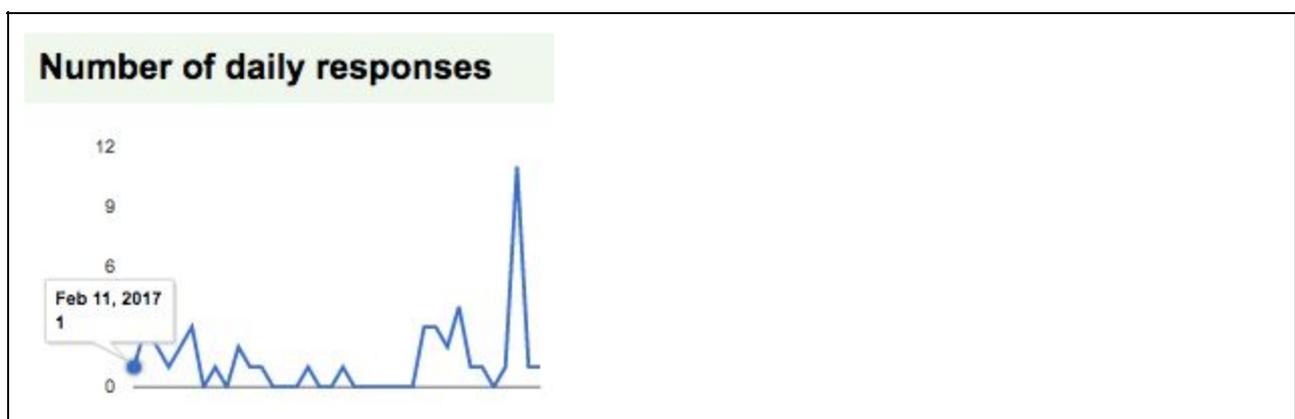
resident in Norway who had completed Emergency Medicine residency in the US. In order to ensure that responders just recently completed their anesthesia residency in accordance with the inclusion criteria, the survey was not anonymized and responses were linked to email address provided. In Norway participants were then cross-referenced to the online register of authorized anesthesiologists (45). At Stanford only anesthesiologists matching the inclusion criteria were chosen by Prof. John Brock-Utne. Participation was also solicited by follow-up email and direct mailing reminders.

3.2 Data collection

Included in the survey were anesthesiologists who had received their authorization between January 2015 and December 2017.

3.2.1 Data collection in Norway

Data collection in Norway commenced February 12th, 2017 and concluded March 19th, 2017. The survey was sent to all Anesthesia department heads in Norway with the request to identify candidates who matched the inclusion criteria. Subsequently a copy of the mail with a link to the survey was to be sent to identified candidates. Any responder was encouraged to forward the survey link to colleagues fitting the inclusion criteria. The goal was to collect at least 20 responders from each country. The following graph shows the number of responses received per day after starting the survey.



3.2.2 Data collection at Stanford

On March 9th, 2017 data collection at Stanford Anesthesia Department commenced with the help of Prof. John Brock-Utne. He sent out the survey by email to both CA-3 anesthesia residents and Clinical Instructors that matched the inclusion criteria. He also personally collected survey data by seeking out candidates in the OR. On March 19th, 2017 the data collection at Stanford concluded once a sufficient number of responses had returned.

3.3 Statistical analysis

SPSS (46) and Google sheets (47) were used to analyse data. First, pivot tables were created using google sheets to sort out Norwegian and American responses to all remaining survey questions. Thereafter an independent sample T-Test was calculated for questions with numeric variables. A Chi-square-Test was used for a questions with string variables. A P-value of less than or equal to 0.05 was considered significant.

4 Results of the survey

Twenty-three anesthesiologists in the US and twenty-four in Norway answered the survey between February 11th 2017 and March 19th 2017.

Statistical analysis of all questions are listed in the table below.

T-Test					
Nr.	Question	Norway (n=24) mean	USA (N=23) mean	Mean Diff.	p-value
2	How many residents participated in your program?	34,17	60	-25,833	0,000
3	Do you feel confident that you have learned all the technical skills required to work independently as attending?	8,08	8,7	-0,612	0,172
4	Do you feel that you had sufficient one-on-one training with an attending during your residency?	6,46	9,09	-2,629	0,000
5	How confident do you feel performing a intubation with direct laryngoscopy ?	9,63	9,78	-0,158	0,330
6	How confident do you feel performing a intubation with indirect video laryngoscopy ?	9,21	9,83	-0,618	0,025
7	How confident do you feel performing a fiberoptic awake intubation ?	6,42	7,7	-1,279	0,033
8	Do you feel that you had sufficient theoretical/didactic teaching during your training program?	5,96	7,96	-1,998	0,001
9	On average, how many hours of teaching didactics per week did you receive during residency?	2,75	3,39	-0,641	0,059
10	Has there been focus on receiving and giving feedback on your performance?	5,08	6,96	-1,873	0,001
11	Do you think there was sufficient focus on communication with patients and colleagues during your training?	6,04	7,3	-1,263	0,035
13	How often have your technical skills on average been evaluated?	128,95	37,65	91,295	0,010
14	Have you been part of, or been educated in, clinical quality improvement and patient safety programs?	4,92	7,52	-2,605	0,001
15	Have you been taught principles of research, including how research is conducted, evaluated, explained to patients, and applied to patient care?	4,88	6,39	-1,516	0,024
16	Do you think your private life is manageable with the workload residency brings with it?	6,83	5,83	1,007	0,080
17	Do you think it is possible to have a family and kids during residency?	8,38	5,13	3,245	0,000
18	How many hours per week on average did you work during your residency?	57,5	80	-22,5	0,000

Chi-Square Test					
Nr.	Question	Norway (n=24) mean	USA (N=23) mean	Mean Diff.	p-value
12	Have you had any kind of leadership training during your residency?				0,159

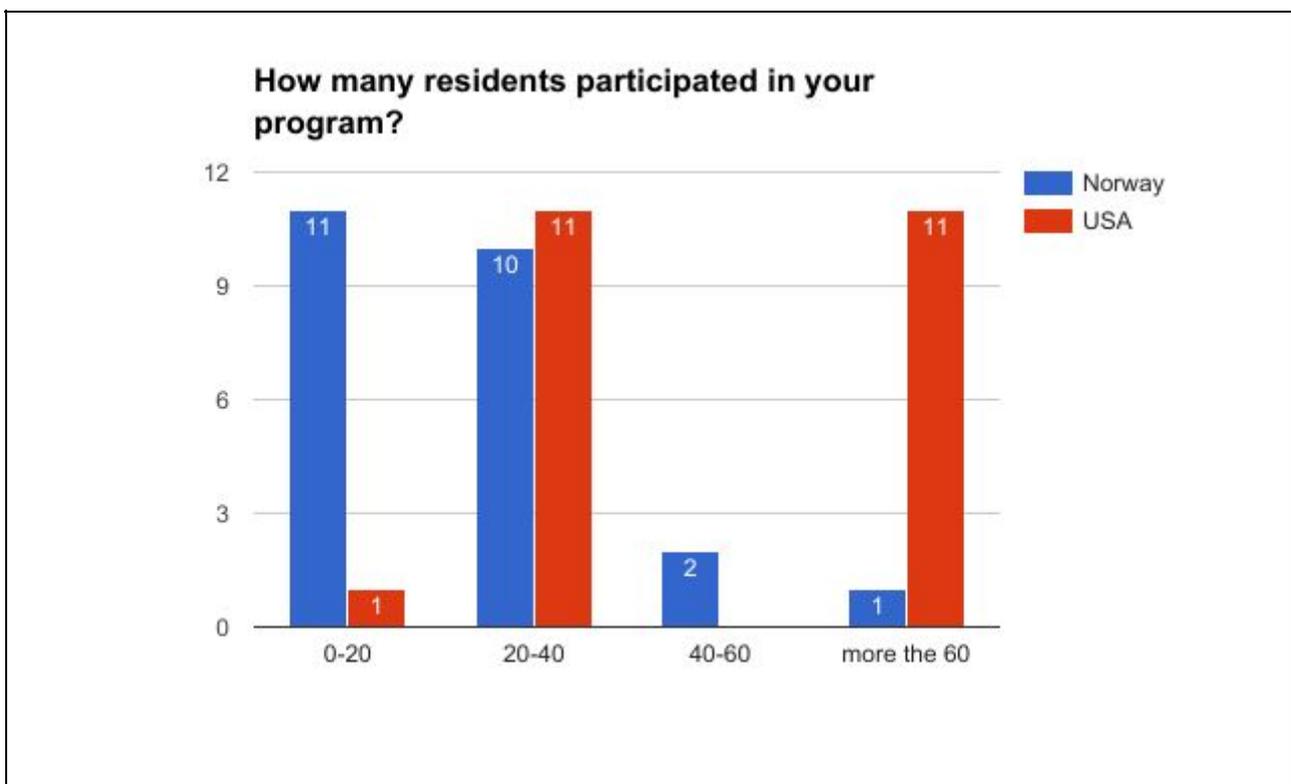
Green: statistically significant differences; Red: statistically **not** significant

The Survey question “*How many residents participated in your program?*” (in the program that the resident was enrolled) showed that residents in the US had approximately twice the number of participants in their program.

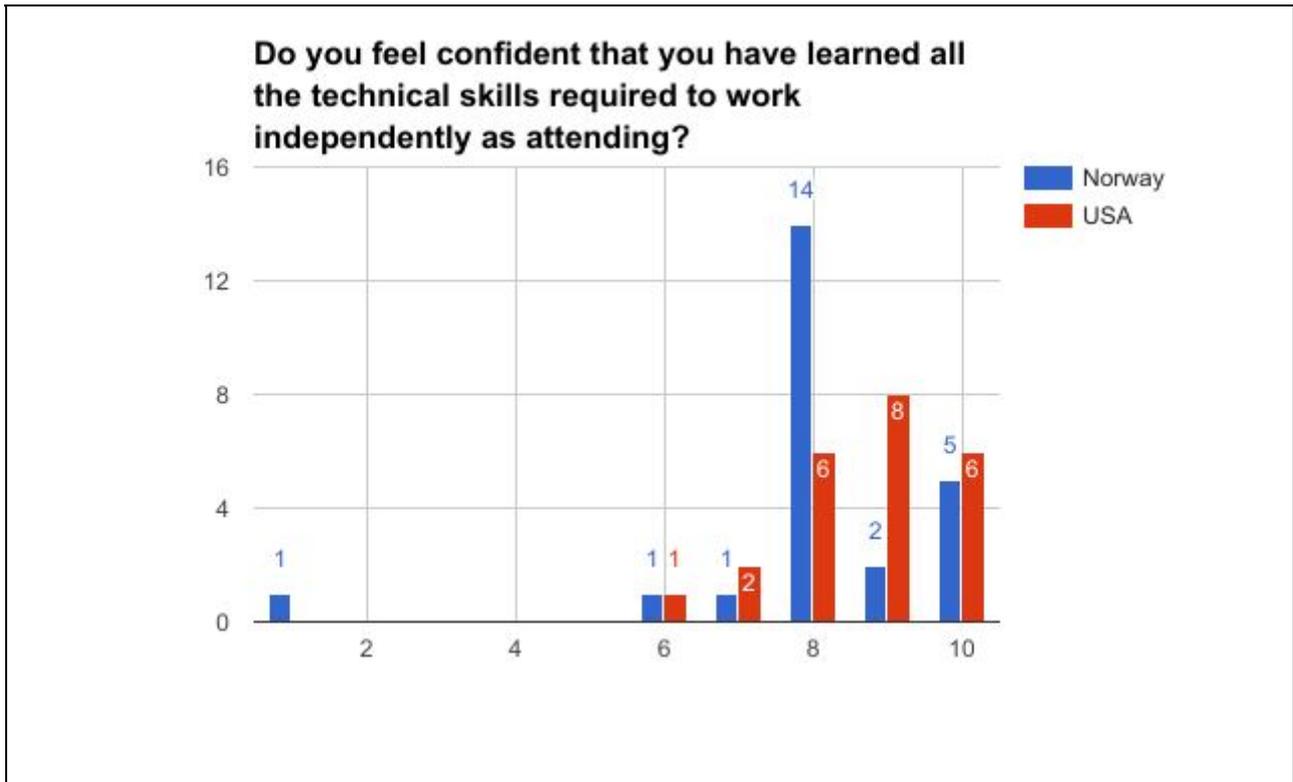
In order to run a T-Test, the following string values were assigned to numeric values.

String	Numeric
0-20	20
20-40	40
40-60	60
More than 60	80

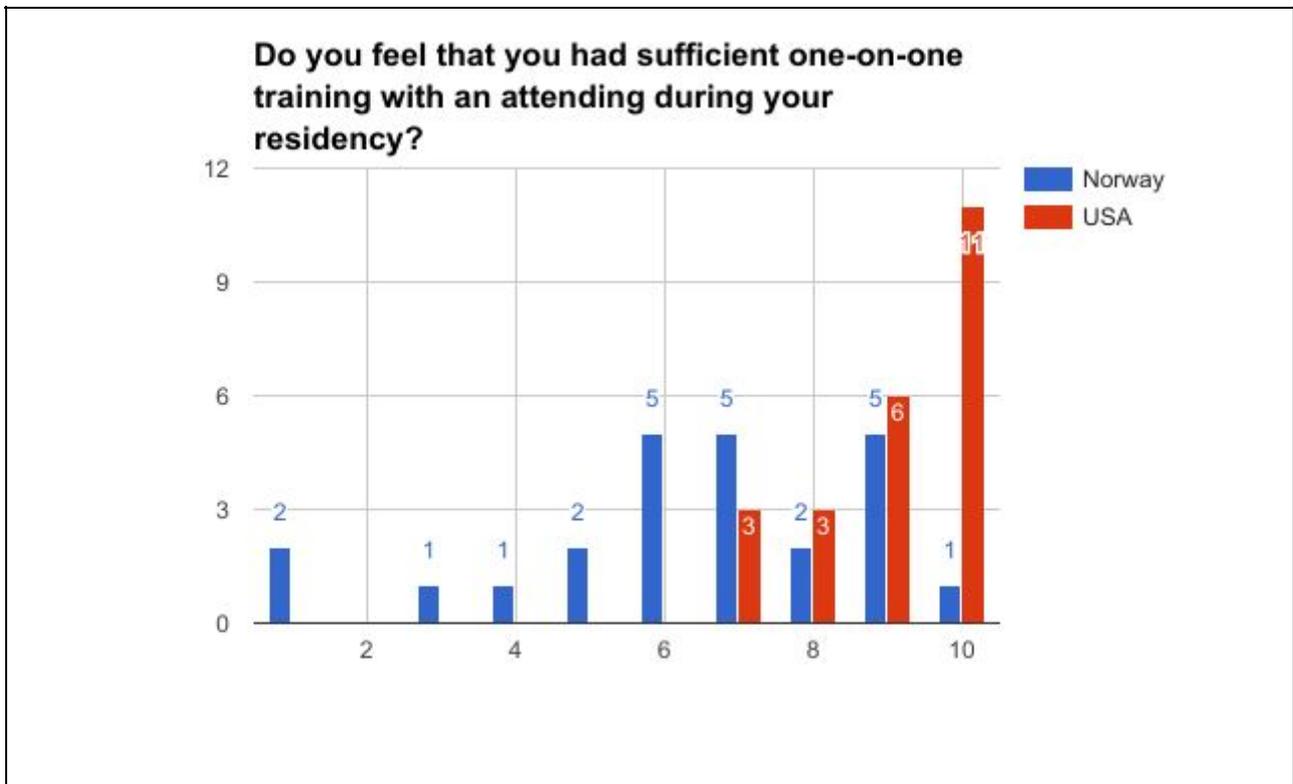
The difference was statistically significant (p-value: 0,000)



The survey question “Do you feel confident that you have learned all the technical skills required to work independently as attending?” showed that American residents trended towards feeling more confident although this was not statistically significant (p-value: 0,172).

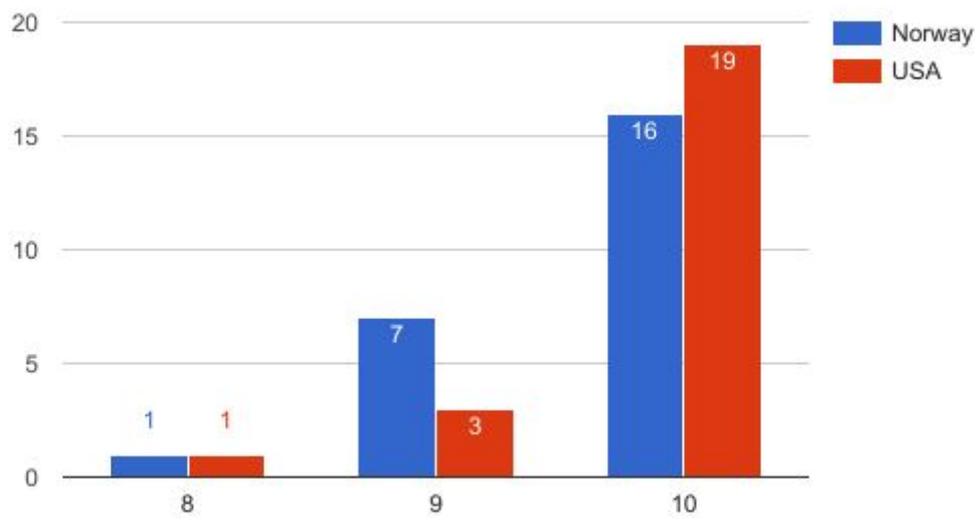


The survey question “Do you feel that you had sufficient one-on-one training with an attending during your residency?” showed a statistically significant difference (p-value: 0,000). American residents received more one-on-one training with an attending than their Norwegian counterparts. Norwegian responders had a wide spread in their responses, suggesting variation amongst residents and residency programs in receiving one-on-one training with an attending in Norway.

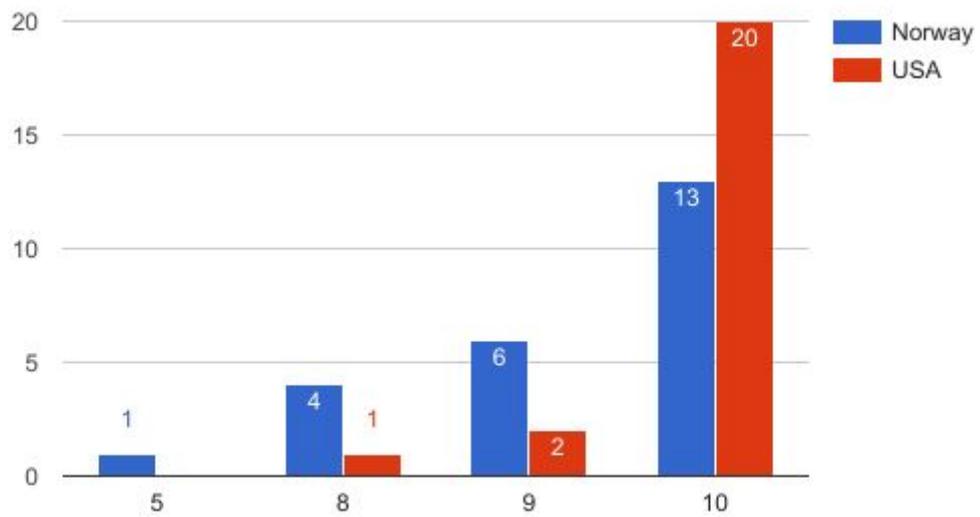


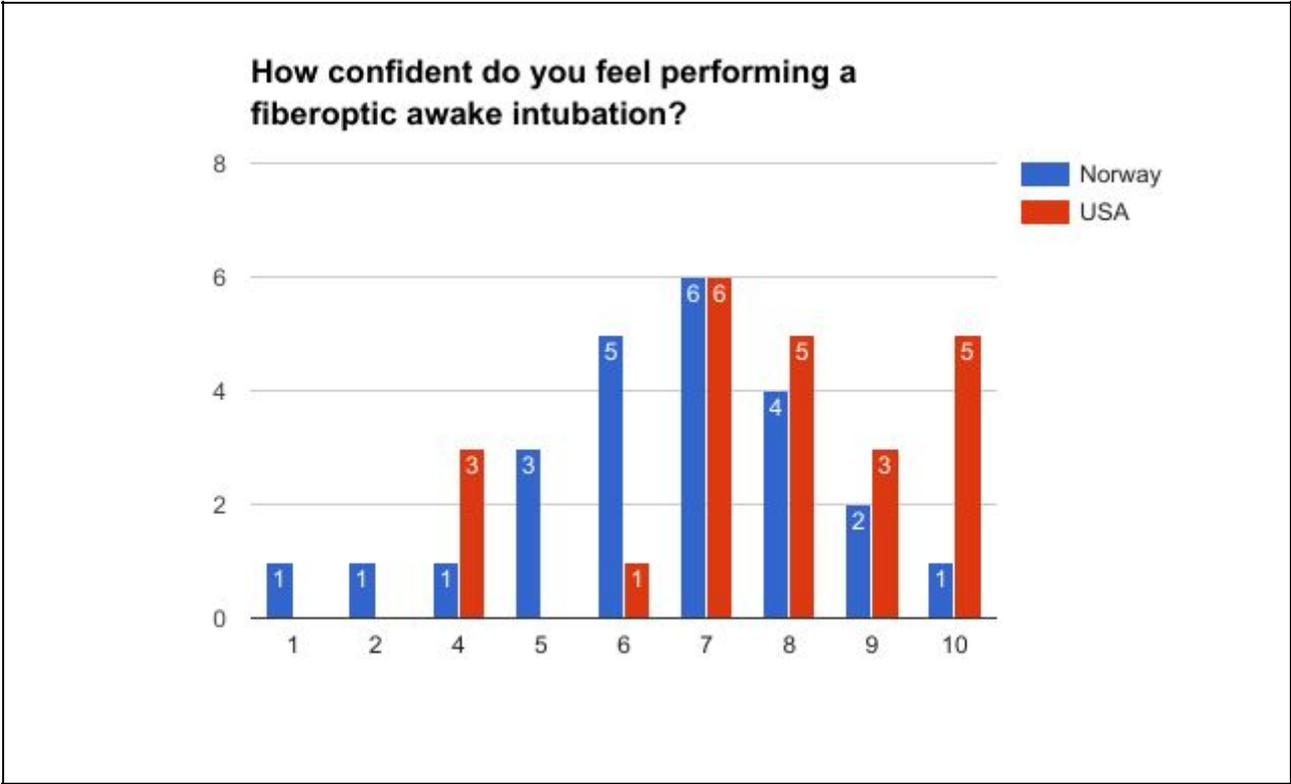
As described above, 3 questions concerning technical skills which are considered easy (direct laryngoscopy), medium (indirect laryngoscopy) and difficult (fiberoptic intubation) were included in the survey. Residents from the US were significantly more confident at 2 out of 3 skills levels, medium (p-value: 0,025) and difficult level (p-value: 0,033).

How confident do you feel performing a intubation with direct laryngoscopy?

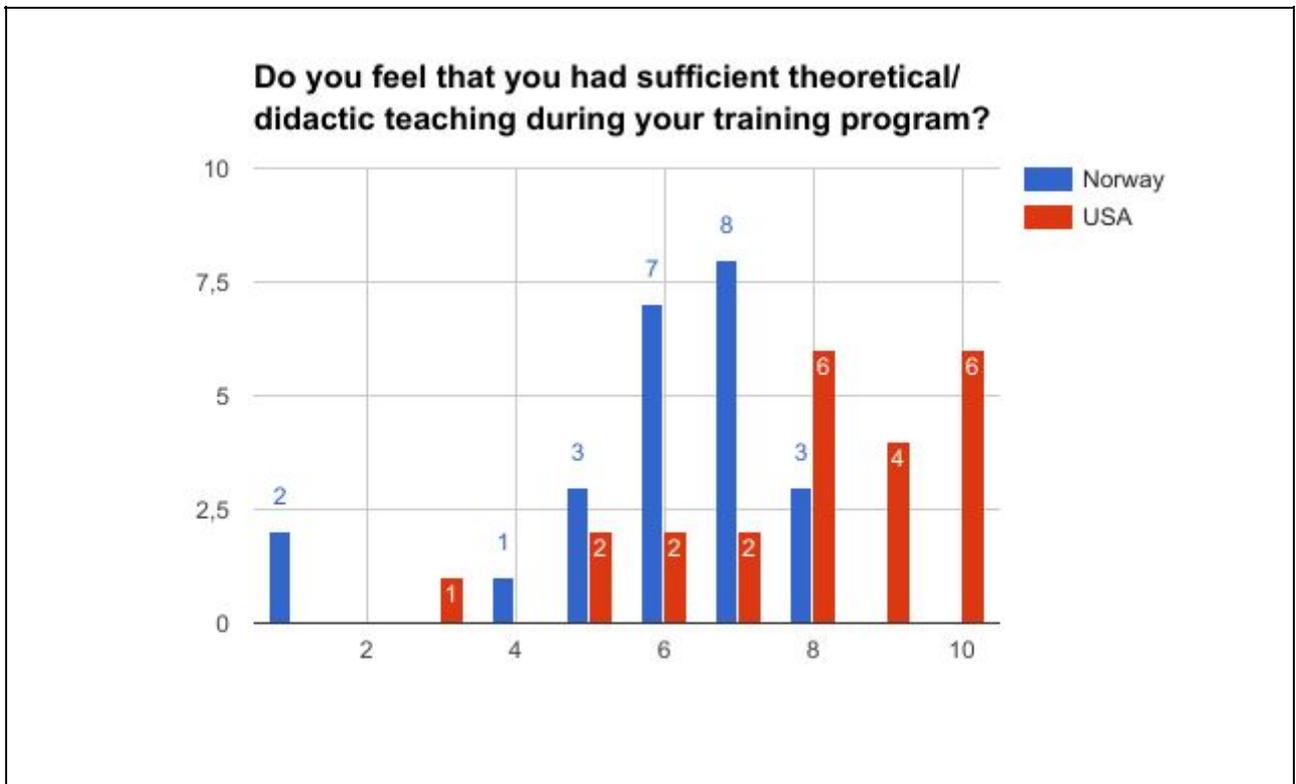


How confident do you feel performing a intubation with indirect video laryngoscopy?





The next survey question “*Do you feel that you had sufficient theoretical/didactic teaching during your training program?*” showed that residents from the US scored significantly more likely (p-value: 0,001) to feel that they had sufficient theoretical/didactic teaching during their training program.

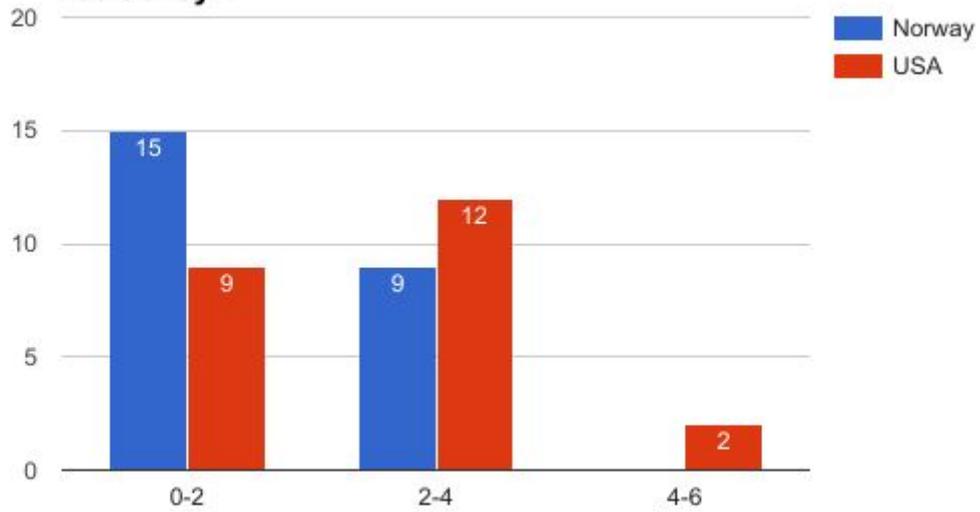


The survey question “*On average, how many hours of teaching didactics per week did you receive during residency?*” showed a trend towards more hours of teaching didactics per week in the US than Norway (p-value: 0,059).

In order to run a T-Test, the following string values were assigned to numeric values.

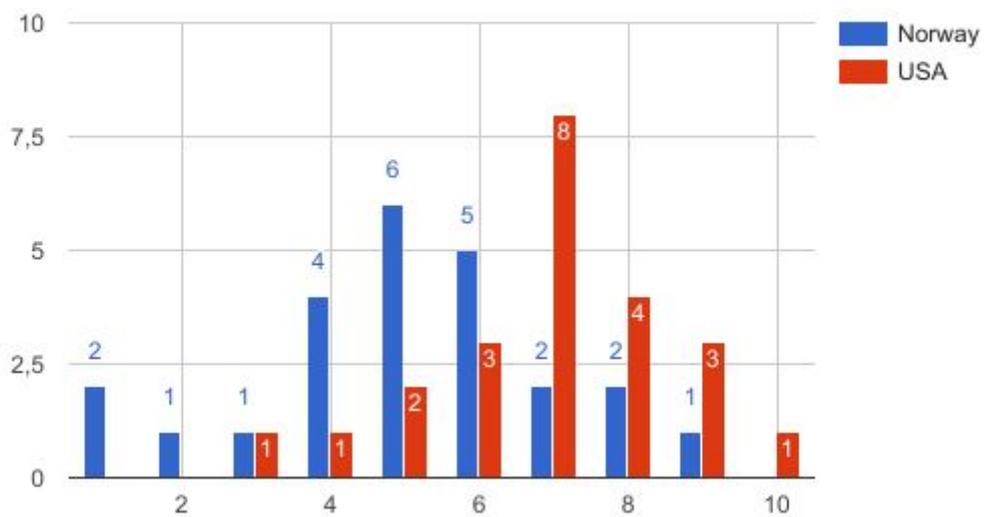
String	Numeric
0-20	20
20-40	40
40-60	60
more than 60	80

On average, how many hours of teaching didactics per week did you receive during residency?

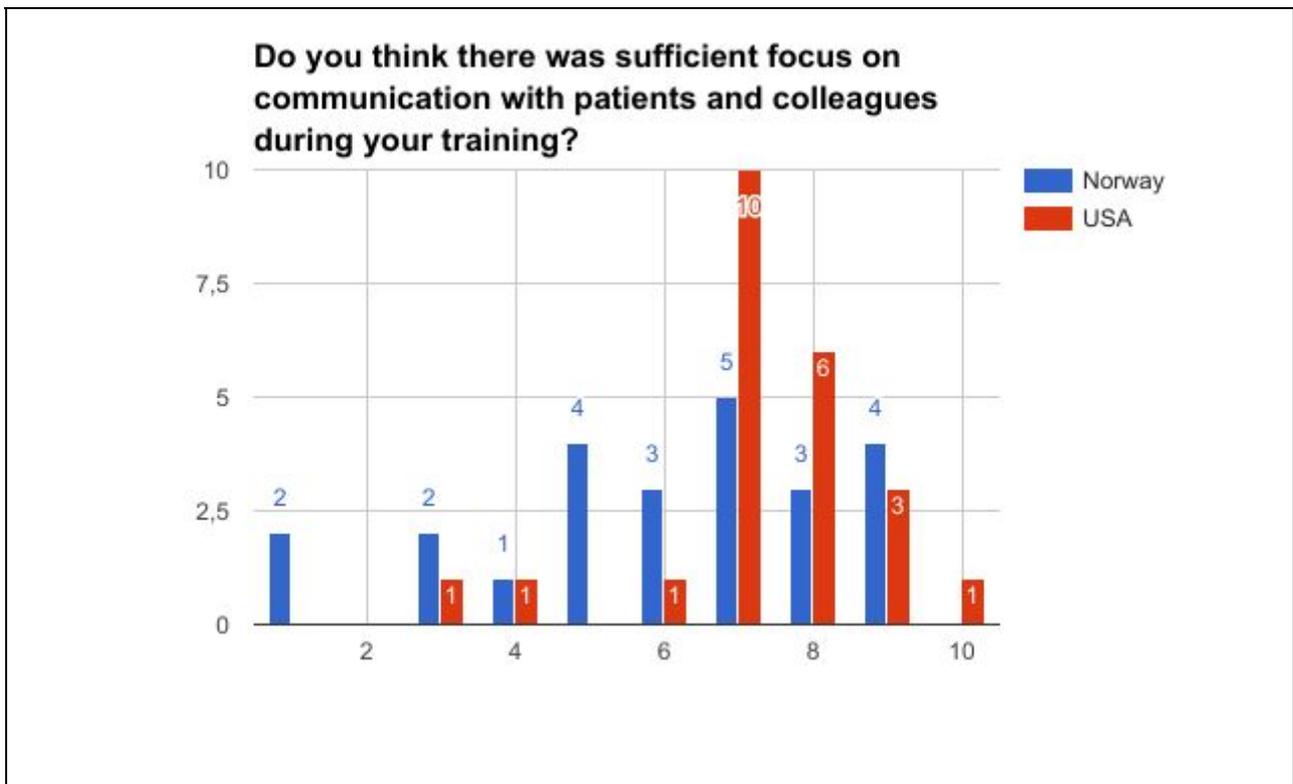


When asked “*Has there been focus on receiving and giving feedback on your performance?*” residents in the US were more in agreement than their Norwegian counterparts. (p-value: 0,001).

Has there been focus on receiving and giving feedback on your performance?



The next survey question “*Do you think there was sufficient focus on communication with patients and colleagues during your training?*” showed that Norwegian residents had widespread responses suggesting a mixed focus on communication. American residents peaked at high scores 7-10. Differences in mean were statistically significant (p-value: 0,035).



The survey question “*Have you had any kind of leadership training during your residency?*” showed, that Norwegians responded more often with yes, however this was not statistically significant (p-value: 0,159).

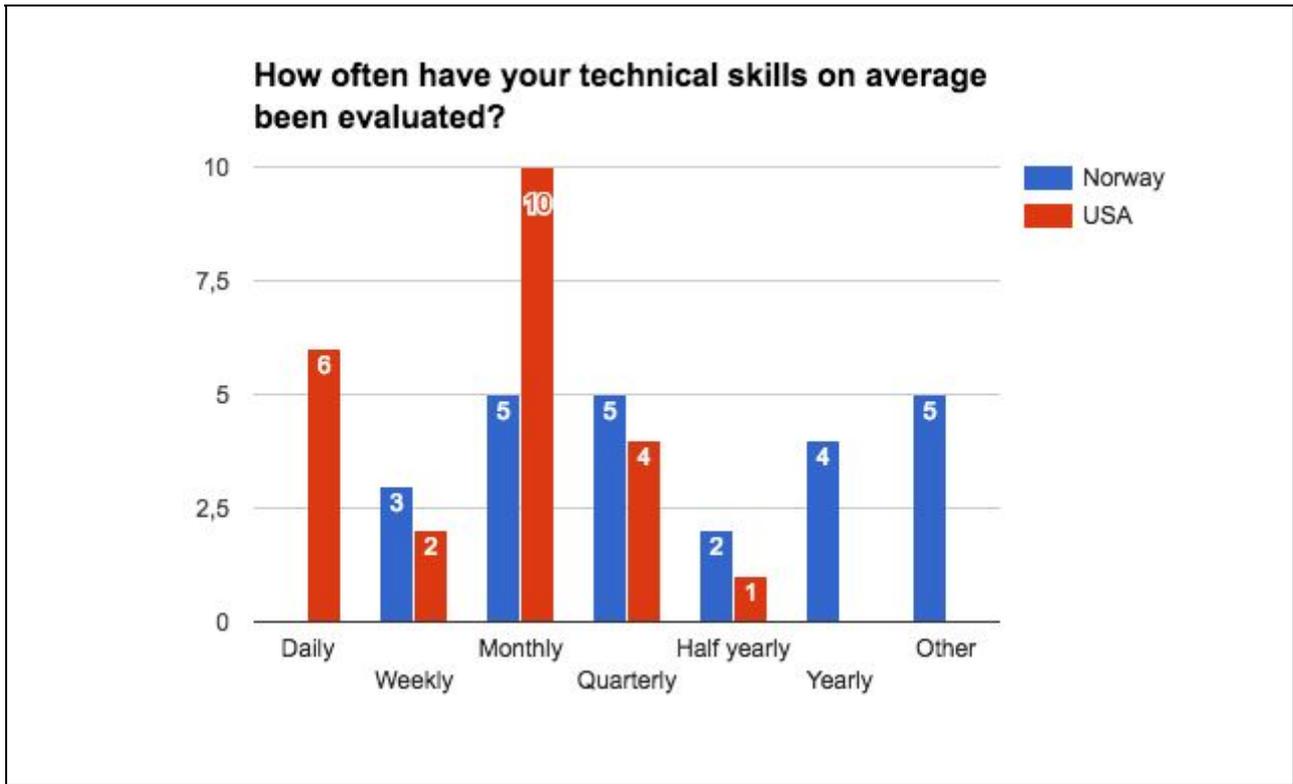


The survey question “*How often have your technical skills on average been evaluated?*” returned mixed results from Norwegian residents whereas American residents mostly reported monthly evaluations. In order to run a T-Test for linear scale, the following variables were converted from string to numeric value.

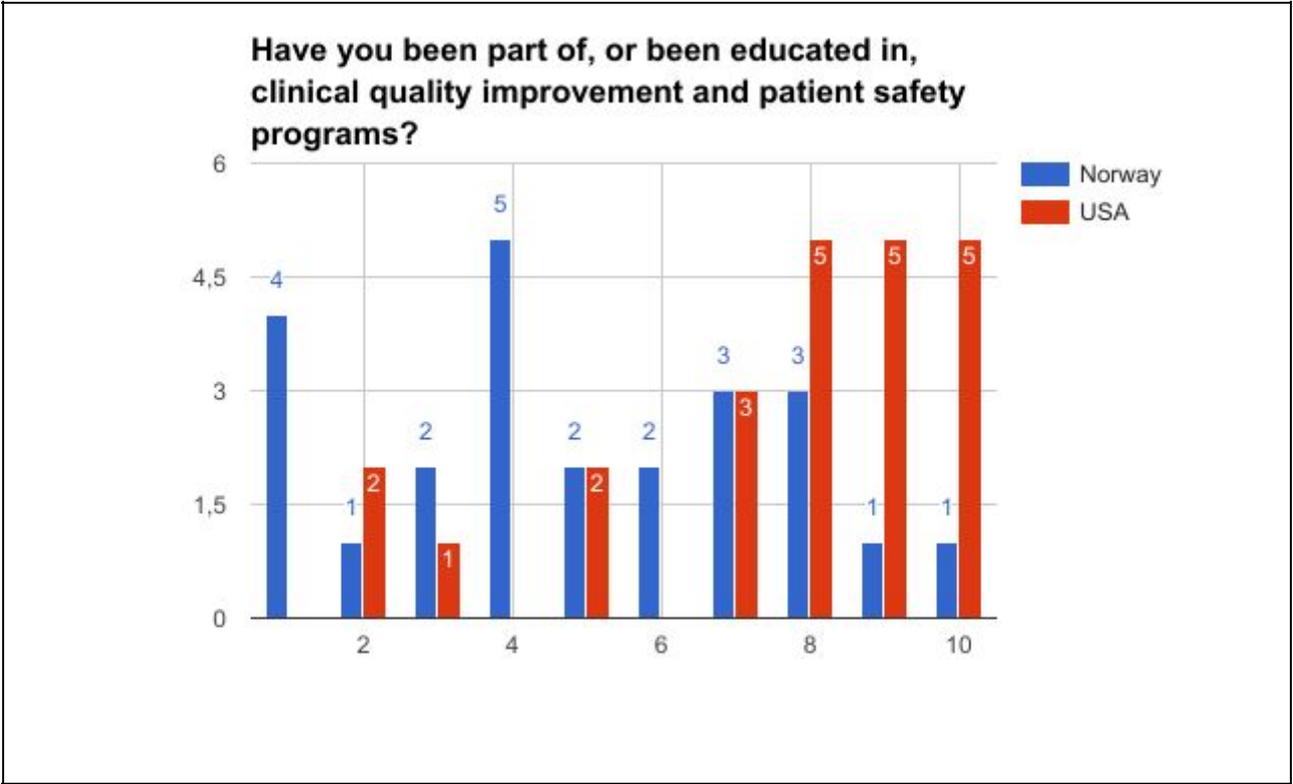
String	Numeric
Daily	1
Weekly	7
Monthly	30
Quarterly	91
Half yearly	182
Yearly	365
Other	

The String “Other” was inexpedient and therefore categorized with “blank” data.

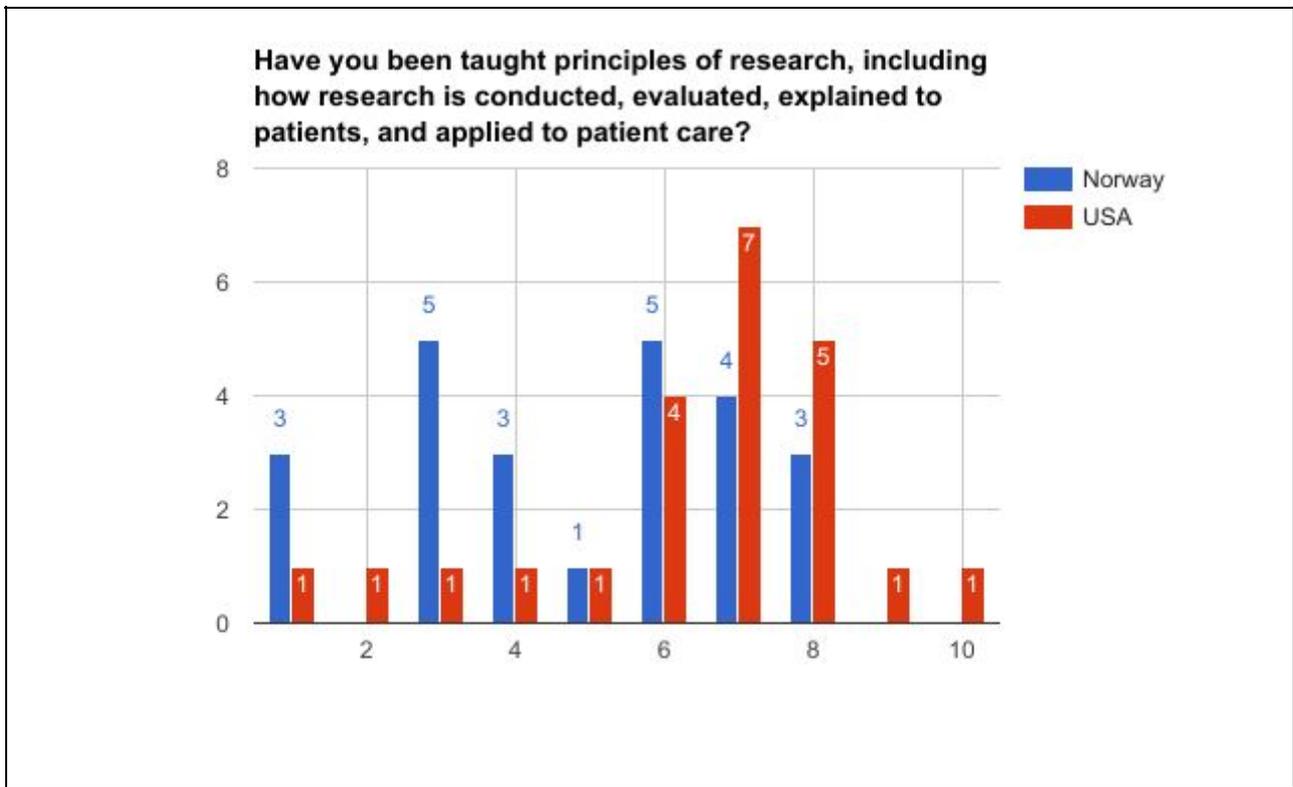
The difference in means was statistically significant (p-value: 0,010).



The survey question “*Have you been part of, or been educated in, clinical quality improvement and patient safety programs?*” showed both in the US and Norway a wide range of results. There was still a significant peak in the high scores 8-10 in the responses from US residents suggesting that they more often have been part of, or been educated in, clinical quality improvement and patient safety programs. The difference was statistically significant (p-value: 0,001).

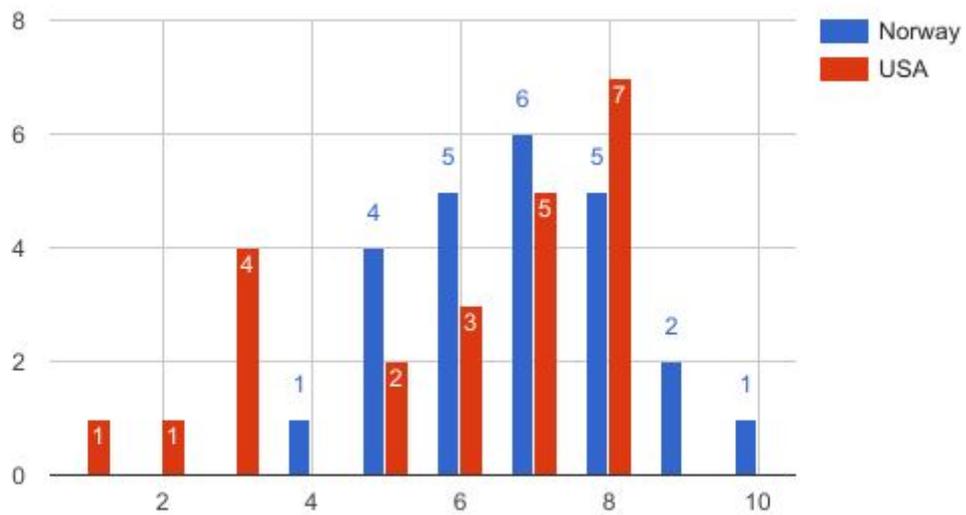


The next survey question “*Have you been taught principles of research, including how research is conducted, evaluated, explained to patients, and applied to patient care?*” showed a wide range of results from both the US and Norway. There was a peak in the US responders around 7-8 resulting in a higher mean score which was statistically significant (p-value: 0,024).

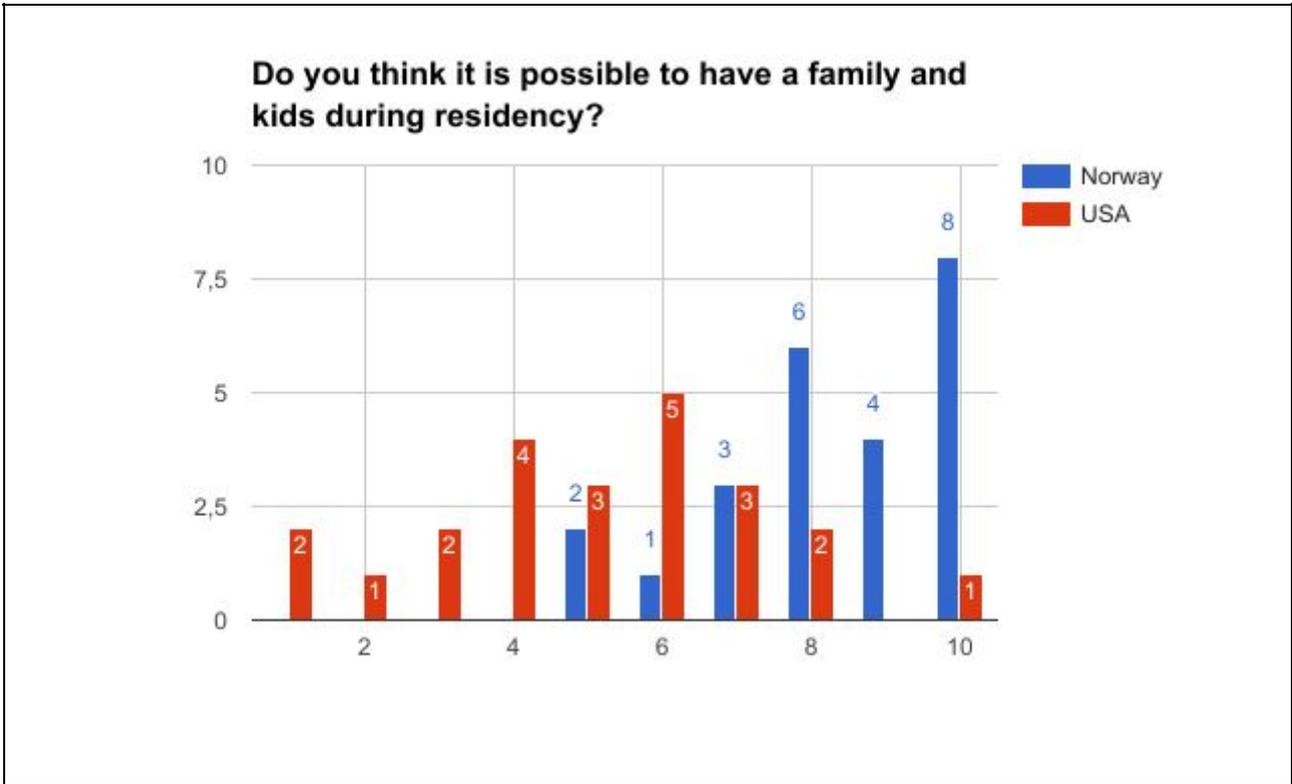


The survey question “*Do you think your private life is manageable with the workload residency brings with it?*” unmasks, that 6 out of 23 responders from the US think private life is less manageable with the workload residency brings with it, while the remaining 17 felt that their private life is manageable with the workload residency brings with it - the majority of Norwegian respondents also felt this way. The difference was not statistically significant (p-value: 0,080).

Do you think your private life is manageable with the workload residency brings with it?



The survey question “Do you think it is possible to have a family and kids during residency?” clearly shows that Norwegian residents think it is possible to have family and kids during residency, whereas US residence answers are widespread. The difference in mean was statistically significant (p-value: 0,000).



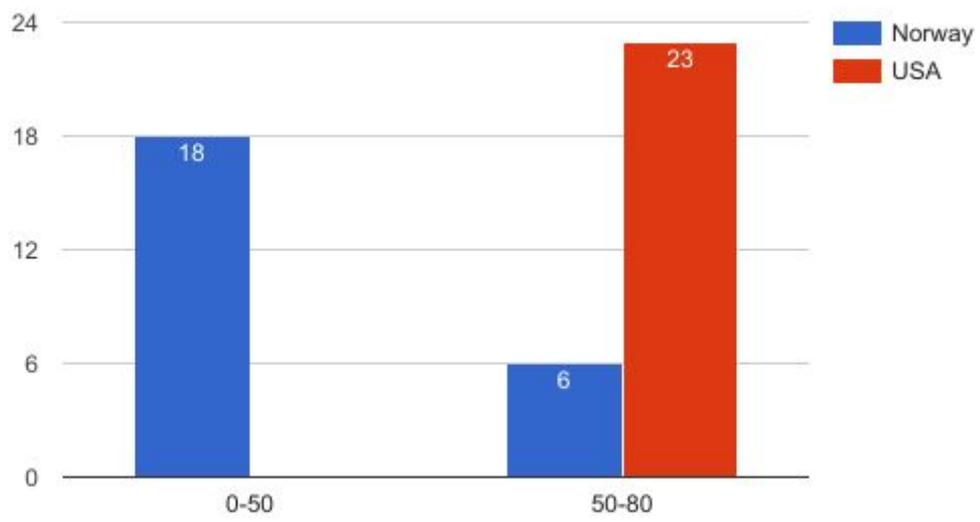
The question “*How many hours per week on average did you work during your residency?*” showed that the American residents do work a lot more hours per week on average in comparison to their Norwegian counterparts.

In order to run a T-Test, the following string variables were assigned to numeric values.

String	Numeric
0-50	50
50-80	80

The results were statistically significant (p-value: 0,000).

How many hours per week on average did you work during your residency?



5 Discussion

In the following we will take a closer look at the responses received from the survey participants. We will see that two aspects have shown to be of significant difference between the two compared education systems: the intensity and quality of the received training, and the perceived overall quality of professional versus private life of the trainees (“work/life balance”).

5.1 Discussion of survey questions

5.1.1 Size of residency programs

American residents took, on average, part in a larger residency program. Since the survey was in the US only distributed at Stanford and in Norway at several hospitals, the difference in size is not surprising. Still the question can be asked, does size matter? In a paper comparing differently sized pediatric residency programs the authors demonstrated that *“programs that have approximately 13 or more board-eligible graduating residents a year are significantly more likely to be in compliance with the ACGME 70% standard”* (48). *“Review Committees will closely monitor programs’ response rates and will review programs that fail to meet the compliance requirements. A 70% response rate is required for all programs with four or more active residents/fellows currently training”* (49).

In Norway anesthesia training in the “old education system” is divided into a two-level hospital model. Level-1, where anesthesiology basics can be acquired and level-2 where advanced knowledge in the fields of pediatric-, thoracic- and neuroanesthesia and transplantation can be acquired. Level-1 hospitals are usually smaller hospitals with therefore a lower number of residents compared to level-2 hospitals which usually are university hospitals. In the new upcoming education system anesthesia residents in Norway will still have to switch hospitals to acquire all needed competencies but there is an intention to create an education course which integrates both hospital training periods under the same roof - *“...this conceivably done by designing uniform and scheduled educational programs.”*(50).

5.1.2 Patient Care

American residents scored higher in both survey questions concerning patient care – working independently and one-on-one training. At Stanford there is a continuous scoring system for both residents and clinical instructors in place which allows continuous improvement in learning and teaching. Dexter and Hindman suggested that *“anesthesiology department managers should not only be monitoring (and perhaps reporting) the quality of their departments’ level of supervision, but also establishing processes so that individual anesthesiologists can learn about the quality of supervision they provide”* (51). This appears to be lacking in the current Norwegian system, but it is a focus area in the new upcoming education system (50). Under the heading -The need for quality assurance- it is noted *“good unified national systems and structures which safeguard the quality of specialist training should be established”* (50).

Amongst the 3 technical skill questions, considered easy, medium and advanced, the American residents scored significantly higher in terms of medium and advanced skills. This suggests that the learning environment in the US with more one-on-one training returns better results than the Norwegian apprenticeship “Mester svenn prinsippet” model in which residents quite early in their training work on their own without supervision. This too has been recognized as a focus area in the new anesthesia education system as outlined under the heading -Master-apprentice principle- *“a necessary but not sufficient condition. In the current scheme, there is little quality assurance of this arrangement”* (50).

5.1.3 Medical knowledge: theoretical/didactic teaching

American residents scored higher in having sufficient theoretical/didactic teaching during their training program and also having more hours of teaching per week.

The introductory presentation for Stanford anesthesia advertises that there are more than 500 lectures/yr for anesthesia residents (52). There is daily teaching during lunch for residents. There is a “journal club” once per week, where typically 3-4 residents present and evaluate a scientific paper and present it to their peers. There are also morbidity and mortality rounds (M&M rounds) once per month, wherein interesting cases often with suboptimal outcomes are presented by residents and

discussed for quality improvement measures. Perhaps the most important setting in which residents are taught on a daily basis is with a supervising attending directly during cases in the OR.

In Norway staff numbers for anesthesiologists facilitating the OR schedule are significantly lower than at Stanford. Norwegian attendings and residents are expected to cover 2-3 ORs depending of course on the degree of difficulty of the case. During the case nurse anesthetists remain in the OR and monitor the patient. The high OR-per-anesthesiologist ratio by itself reduces the possibility to supervise residents considerably. At the largest hospital in the nation, the University Hospital in Oslo (Rikshospitalet), there are similar case/topic presentations every morning as at Stanford during lunch time. However, there is little teaching in the OR during cases. There was also a weekly hour of lecture in which residents or attendings prepared a topic. In the OR typically only with difficult cases were attendings working together with an resident. The problem with the lack of direct resident supervision of practical skills is, that the resident can pick up inexpedient habits and incorporate them in their “anesthesia toolbox.”

5.1.4 Professionalism: feedback on performance

American residents scored significantly higher to the question regarding giving and receiving feedback on their performance. Since 2007 there has been an Anesthesia Faculty Teaching Scholars Program in place at Stanford with the effort to further train faculty and improve residency education (27). *“The Teaching Scholars Program housed within the Department of Anesthesia supports faculty in these areas:*

1. *attending education-related meetings*
2. *engaging in a monthly seminar on core topics paired with independent study reading*
3. *undertaking a project to improve resident education” (27).*

It is mentioned that this kind of program is the first of its kind in the US, and as such it is perhaps not surprising that a similar program does not exist as of yet in Norway. In his paper "Giving feedback - an integral part of education", Schartel states - *“Feedback is an essential component of the educational process, but one in which medical educators, especially those who teach clinical medicine, have little education” (53).* In the document outlining the new anesthesia education system in Norway the following is specified under the heading: *“The health authorities have the*

following tasks: Ensure, that there will be educated enough **supervisors** through personalized **tutor courses**” (50). This promises an increased focus on educating educators in Norway as well.

5.1.5 Interpersonal and communication skills and leadership training

American residents scored significantly higher regarding the question whether there was sufficient focus on communication with patients and colleagues during their training.

Effective Interpersonal and Communication skills is one of six core competencies specified as the goals and objectives for residents in the Stanford University Anesthesiology Residency Program brochure (54). One example of the focus on these skills is the following extract of Goals and Objectives for Residents (CA-1) during the Abdominal Surgery Rotation (55).

“Interpersonal skills, communication skills and professionalism

- *Effective, empathic and polite communication with patients and their families to promote knowledge and reduce anxiety.*
- *Seeking help and not abandoning the patient and his family in cases of conflicts.*
- *Collegial and respectful interaction with the OR team and avoiding conflicts.*
- *Being upfront and asking questions in all unclear situations.*
- *Seeking help when patients’ safety is at stake.*
- *Participating and initiating the time-out with the OR team.*
- *Identifying of and addressing any unprofessional behavior before it leads to conflicts.*

Perceiving critique as an impetus towards improvement rather than personal defeat.”

In the new Norwegian anesthesia education system there will be focus on communication skills as well. Under the heading *Shared competence modules for all specialties* (50) it is noted that “*The Commission proposes to introduce its own compulsory skills modules in **communications**, ethics, knowledge management, quality assurance, patient safety, system understanding, interaction, education of patients and their relatives, as well as organization and leadership*”. In Norway, regulations concerning specialist training for doctors and dentists (specialist Regulations) are considered legal requirements including mandatory skills for communication (56).

Regarding the question concerning whether or not residents have had any kind of leadership training during their program 46% of Norwegians answered **yes** as compared to 26% of Americans. This was not a statistically significant difference. In Norway a course in administration and leadership is a mandatory part of the anesthesia specialization program and, as discussed above, in the new anesthesia education system in Norway, leadership is to be part of the compulsory skills modules (50). Although the Stanford Anesthesiology department invokes the slogan “Training Tomorrow's Leaders in Anesthesia and Perioperative Medicine” on the residency information website, no further information regarding concrete leadership training during residency at Stanford could be identified (57).

5.1.6 Practice-based learning and improvement

Residents from the US answered that, on average, their technical skills are evaluated monthly. Conversely, Norwegian residents had a wide variation in their responses suggesting that there is no standardized or structured way of evaluating technical skills. Although it is advised that Norwegian residents should meet with their supervisor on a monthly basis, there is no equivalent system in place for evaluating technical skills at the moment. As mentioned above, anesthesiologists in Norway typically cover 2-3 OR's and therefore supervision of residents is not possible to the extent that it is at Stanford. In order to obtain as frequent evaluations more anesthesiologists would have to be employed.

5.1.7 Systems-based practice: clinical quality improvement and research

Residents from the US were more likely to respond affirmatively regarding whether or not they had been part of, or been educated in, clinical quality improvement and patient safety programs. In the Anesthesia Residency Program at Stanford University the **Goals** and Objectives for Residents (CA-1) with focus on System-Based-Practice are as followed (55):

- *“Review and confirm the preoperative assessment note in EPIC for the patient under your care.*
- *Be aware of the consequences of your decisions in a larger context of healthcare, patient safety and ethical norms.*

- *Be familiar with hospital guidelines and keep yourself up-to-date with the latest recommendations of different medical societies.”*

This again confirms that also clinical quality improvement is systematically evaluated in the American education system.

As discussed above, there is planned an increased focus on quality improvement under the new Norwegian anesthesia education system (50). Under the heading, *-The need for quality assurance-* the following is written. *“In line with increased requirements for quality and patient safety, it should, however, be focused far more on clear, national learning objectives where learning outcomes are monitored systematically and residents get tested in achieved competence key areas”* (50).

Residents from the US scored also higher on the question whether they had been taught principles of research, including how research is conducted, evaluated, explained to patients, and applied to patient care. As previously mentioned, Stanford had a research budget of 6,5 million USD (55 million NOK) in 2011 (27). This significant budget highlights the importance of research at Stanford. Furthermore, regularly held journal clubs where scientific publications are discussed are integrated in the weekly education program for residents at Stanford. This kind of teaching also happens in Norway, just not in the same systematic way. In the new anesthesia education system in Norway, research education will be prioritized (50).

5.1.8 Work-life balance

Norwegian residents scored higher than their American counterparts regarding whether residents think private life is manageable with the workload residency brings with it, and whether they think it is possible to have a family and kids during residency.

Norway is known for its advanced welfare system (58). State-funded maternity leave is one year with 80% salary or 8 months with 100% salary (59). State-subsidized childcare makes it possible and common that both parents can work at the conclusion of maternity leave which facilitates having a family during residency training.

5.2 Limitations of the survey

This study has some limitations. First, we recruited a convenience sample of consecutive residents, without a-priori calculation of the sample size; this issue may have influenced the results of the study.

Survey respondents in the US all came from Stanford University Hospital. Stanford Anesthesia Department is ranked by reputation in the doximity residency navigator (39) as one of the the top 10 residency programs in the US. Therefore it is unlikely to be representative of the “average” American anesthesia residency program. Respondents in Norway were from several hospitals and as such were more representative of the Norwegian education system.

It also has to be considered that there might be a cultural difference in self-esteem and ASC (academic self-concept) of Norwegians and Americans residents which could alter the result of the survey. In an interesting master thesis from 2010 “*Self-esteem, Competence and Classroom Engagement: A Quantitative and Qualitative Study in Norway and North America*” a cross-cultural study was performed to explore differences between Norwegian and American 5th-7th graders on self-esteem and school-related variables such as academic self-concept (ASC), academic achievement, and classroom engagement. This study found that American students scored higher than the Norwegian students on both self-esteem and ASC. Furthermore, American teachers rated their students higher on classroom engagement (60). The author attributed these differences to cultural differences such as “equality” and “individualism”. There has been much written about the "Law of Jante" in Norway which is a cultural phenomenon that holds that all are equal and no one should believe that they are better than anyone else in society (61). This is in contrast to American society in which individuals are raised being told how "special" they are and that they are "great" making them want to live the "American Dream" (60).

5.3 Conclusion

As discussed, both national anesthesia education systems have their advantages and disadvantages. The Norwegian system is currently under transformation and many of the negatives of the old system are focus areas for improvement in the upcoming system. As part of this system improvement there is value in looking closely at the American system - to learn from its positive

attributes and avoid its negatives. For example the implementation of improved resident one-on-one supervision, regular evaluation of practical skills of residents, evaluation and education of supervisors, and implementation of journal clubs are all areas which can be improved in Norway. After identifying these areas for improvement the challenge then becomes implementation which must be undertaken in a systematic, comprehensive and durable manner. Conversely, improving work-life-balance of American residents is a more difficult task. A further drastic reduction in working hours would be necessary. However this could result in decreased training intensity and thereby reduce the quality of the education in the US, as concluded in a recent review article from Bolster et. al on the effect of restricting residents' duty hours on patient safety, resident well-being, and resident education - "*The added duty hour restrictions implemented in 2011 appear to have had an unintended negative impact on resident education*" (62). There is a need for more extensive and representative data collection in the US to further understand that system and to allow for recommendations on system improvement.

The aim of both systems is to train effective, efficient and experienced anesthesiologists - efforts to evaluate and improve these systems as we have done in this thesis are important to ensure that this goal is met.

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7 Attachment (Survey)

Postgraduate Anesthesiology training: A comparison of the American and Norwegian models

Welcome! Thank you for participating in our effort to compare US and Norwegian Postgraduate Anesthesiology training.

Your time is valuable and we greatly appreciate your assistance with this project.

*Må fylles ut

1. E-postadresse *

Demographic data

2. Where did you complete your residency program? *

Markér bare én oval.

- USA
- Norway

3. How many residents participated in your program? *

Markér bare én oval.

- 0-20
- 20-40
- 40-60
- more the 60

Patient Care

Definition:

- 1: Preanesthetic evaluation, assessment, and preparation
- 2: Anesthetic plan and conduct
- 3: Perioperative pain management
- 4: Management of perianesthetic complications
- 5: Crisis management
- 6: Triage and management of critically ill patient in nonoperative setting
- 7: Acute, chronic, and cancer-related pain consultation/management
- 8: Technical skills: airway management
- 9: Technical skills: use/interpretation of monitoring and equipment
- 10: Technical skills: regional anesthesia

4. Do you feel confident that you have learned all the technical skills required to work independently as attending? *

Markér bare én oval.

	1	2	3	4	5	6	7	8	9	10	
not at all	<input type="radio"/>	very much so									

5. Do you feel that you had sufficient one-on-one training with an attending during your residency? *

Markér bare én oval.

	1	2	3	4	5	6	7	8	9	10	
not at all	<input type="radio"/>	very much so									

6. How confident do you feel performing a intubation with direct laryngoscopy? *

Markér bare én oval.

	1	2	3	4	5	6	7	8	9	10	
Not confident at all	<input type="radio"/>	Very confident									

Intubation



7. How confident do you feel performing a intubation with indirect video laryngoscopy? *

Markér bare én oval.

	1	2	3	4	5	6	7	8	9	10	
Not confident at all	<input type="radio"/>	Very confident									

Indirect laryngoscopy



8. How confident do you feel performing a fiberoptic awake intubation? *

Markér bare én oval.

	1	2	3	4	5	6	7	8	9	10	
not confident at all	<input type="radio"/>	Very confident									

Fiberoptic awake intubation



Medical Knowledge

9. Do you feel that you had sufficient theoretical/didactic teaching during your training program?*

Markér bare én oval.

	1	2	3	4	5	6	7	8	9	10	
not at all	<input type="radio"/>	yes, absolutely									

10. On average, how many hours of teaching didactics per week did you receive during residency?*

Markér bare én oval.

- 0-2
- 2-4
- 4-6
- more than 6

Professionalism

Definition:

- 1: Responsibility to patients, families, and society
- 2: Honesty, integrity, and ethical behaviour
- 3: Commitment to institution, department, and colleagues
- 4: Receiving and giving feedback
- 5: Responsibility for personal emotional, physical, and mental health

11. Has there been focus on receiving and giving feedback on your performance?

Markér bare én oval.

	1	2	3	4	5	6	7	8	9	10	
not at all	<input type="radio"/>	very much so									

Interpersonal and communication skills

Defintion:

- 1: Communication with patients and families
- 2: Communication with other professionals
- 3: Team and leadership skills

12. Do you think there was sufficient focus on communication with patients and colleagues during your training? *

Markér bare én oval.

	1	2	3	4	5	6	7	8	9	10	
not at all	<input type="radio"/>	yes, absolutely									

13. Have you had any kind of leadership training during your residency? *

Markér bare én oval.

- Yes
- NO

Practice-based learning and improvement

Defintion:

- 1: Incorporation of quality improvement and patient safety initiatives into personal practice
- 2: Analysis of practice to identify areas in need of improvement
- 3: Self-directed learning
- 4: Education of patient, families, students, residents, and others

14. How often have your technical skills on average been evaluated? *

Markér bare én oval.

- Daily
- Weekly
- Monthly
- Quarterly
- Half yearly
- Yearly
- Other

Systems-based practice

Defintion:

- 1: Coordination of patient care within the health care system
- 2: Patient safety and quality improvement

15. **Have you been part of, or been educated in, clinical quality improvement and patient safety programs? ***

Markér bare én oval.

	1	2	3	4	5	6	7	8	9	10	
Not at all	<input type="radio"/>	Very much so									

16. **Have you been taught principles of research, including how research is conducted, evaluated, explained to patients, and applied to patient care? ***

Markér bare én oval.

	1	2	3	4	5	6	7	8	9	10	
Not at all	<input type="radio"/>	Very much so									

Work-life balance

Definition: Work-life balance is a concept including proper prioritizing between "work" (career and ambition) and "lifestyle" (health, pleasure, leisure, family and spiritual development/meditation). This is related to the idea of lifestyle choice.

17. **Do you think your private life is manageable with the workload residency brings with it? ***

Work-life balance

Markér bare én oval.

	1	2	3	4	5	6	7	8	9	10	
not at all	<input type="radio"/>	yes, absolutely									

18. **Do you think it is possible to have a family and kids during residency? ***

Markér bare én oval.

	1	2	3	4	5	6	7	8	9	10	
not at all	<input type="radio"/>	yes, absolutely									

19. **How many hours per week on average did you work during your residency? ***

Markér bare én oval.

- 0-50
 50-80
 more than 80

QR Code of this Form



En kopi av svarene dine blir sendt via e-post til adressen du oppga

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 Google Forms