CHAPTER 8

Main Conclusions of the Report

8.1. Appointment of the investigation committee and its tasks

On 27 October 2016, Páll Matthíasson, CEO of Landspítali University Hospital, and Jón Atli Benediktsson, Rector of the University of Iceland, appointed a committee to investigate the case of Andemariam Teklesenbet Beyene, who was sent for medical treatment from Iceland to Sweden in June 2011, specifically the transplantation of a synthetic trachea that was performed at Karolinska University Hospital. The committee's letter of appointment stated that its task was to focus its investigation on the involvement of Landspítali University Hospital and the University of Iceland, as well as their employees, in the matter.

Dr. jur. Páll Hreinsson, Judge of the EFTA Court in Luxembourg and former Judge of the Supreme Court, Dr. Georg A. Bjarnason, medical oncologist and Senior Scientist at the Sunnybrook Health Sciences Centre in Toronto, Canada, as well as María Sigurjónsdóttir, psychiatrist at Oslo University Hospital in Norway, were appointed to the investigation committee.

The primary objective of the committee is to give an opinion as to whether the decisions of Icelandic healthcare professionals in connection with the synthetic trachea transplantation were in accordance with applicable laws, regulations, and procedures, and whether they have thus met the quality requirements set forth for specialised health services, cf. Article 7 and Article 20, cf. paragraph 4, Article 9 of the Icelandic Health Service Act, No. 40/2007. The role of the committee was, furthermore, to investigate the legal and ethical basis for the participation of Icelandic doctors in publishing an article on the subject in the academic journal Lancet. Moreover, the committee was given the task to investigate the legal and ethical basis for a symposium on Andemariam Beyene's synthetic trachea transplantation, held at the University of Iceland in the summer of 2012. Lastly, the committee was asked to determine whether the conclusions of investigators in Sweden are based in part on incorrect or misleading information with regard to the participation and involvement of Icelandic healthcare professionals in the matter.

As further explained in Chapter 1.2., the committee divided the matter into 34 key questions for investigation.

In accordance with the above, it is the role of the committee to investigate the conduct of employees of the University of Iceland and Landspítali University Hospital in the matters outlined in the aforementioned letter of appointment. In the event that the committee finds misconduct in any of these matters, the rector of the University of Iceland or CEO of Landspítali University Hospital, but not members of the committee, shall decide how to respond to the committee's findings.

Chapter 2 of the report summarises in general terms the primary laws and codes of ethics in force during the time of events under investigation. Moreover, Chapter 4 of the report addresses Andemariam's attitude toward the synthetic trachea transplantation, which he primarily expressed in the media.
8.2. Summary of investigations regarding Sweden's role in the synthetic trachea scandal

In Sweden, where the synthetic trachea transplantation was performed on Andemariam, some investigations have already been conducted while others are still in progress. The finalised reports reveal several interesting and important issues. Chapter 3 of the report summarises the main issues regarding Sweden's role in the synthetic trachea scandal. For example, this chapter states:

■ Despite criticism expressed by hospitals for which Macchiarini had previously worked, mainly in terms of indication decisions, i.e. what kinds of operations were performed on which patients, Macchiarini was appointed at Karolinska Institutet and later at Karolinska University Hospital.

■ At the time the surgery was performed on Andemariam, there was not an adequate scientific foundation for a human transplant of a synthetic trachea seeded with bone marrow cells, combined with the application of growth-stimulating pharmaceuticals. The idea not only contradicted established scientific knowledge and experience, but it was, moreover, too early to conduct scientific research on human subjects. Research performed on animals had yielded highly mixed results. No long-term study of the utility of the synthetic material used in Andemariam's trachea on animals existed. Lastly, no experiments had been conducted on animals during which a stem-cell-seeded synthetic trachea, stimulated by growth factors, had been transplanted.

■ A multidisciplinary conference of doctors and research specialists was held, before the decision for Andemariam's synthetic trachea transplantation was made. This was important, since this entailed a new type of surgery with unknown risks. At this conference, however, the issues of most concern were not discussed, i.e. whether there was enough scientific foundation for the surgery and the kind of possible risks the procedure may entail for Andemariam. Moreover, specialists in certain fields of expertise were lacking, making a professional assessment of these issues impossible. Group thinking may have been a contributing factor as to why Macchiarini's colleagues did not object or ask enough critical questions before the transplantation was performed.

■ Decisions and tasks were rushed before Andemariam went into surgery. The diagnosed tumour was not the size of a golf ball, as had been assumed, but measured 25x11x9 mm post-surgery. The appropriate treatment should, therefore, have been laser debulking of the cancer, localised endoscopic radiation therapy and/or placement of a stent.

■ Andemariam's synthetic trachea transplantation was essentially a clinical trial requiring an ethical approval prior to being performed, in accordance with Swedish law. Had the project undergone such an ethical review prior to the surgery, it would likely not have been approved. Macchiarini's violation of these regulations was reported to the police.

■ The Declaration of Consent signed by Andemariam before the surgery does not fulfil the requirements set forth by Swedish law for participation in scientific research. For example, the declaration does not contain any information about possible risks and complications of the surgery.

■ The following pharmaceuticals were used during the procedure: NeoRecormon (erythropoietin), Neupogen (G-CSF; filgrastim, granulocyte-colony stimulating factor) and TGF-ß3 (transforming growth factor beta-3). NeoRecormon was administered at ten times the recommended dose. Both NeoRecormon and Neupogen were not administered in accordance with their authorised use. Moreover, no research was available on how the two
pharmaceuticals interact when given together. TGF-β3 is not authorised for use in humans, but the synthetic trachea transplant was coated with the pharmaceutical before it was seeded with stem cells. According to the law, a written permit from the Swedish Medical Products Agency would have been needed prior to the surgery in order to use the aforementioned pharmaceuticals in this manner. Such a permit was, however, never applied for. The Swedish Medical Products Agency reported this violation to the police. In addition, authorisation from the Medical Products Agency would be required to use stem cells in this manner. Lastly, authorisation was needed from the Swedish Medical Products Agency for implanting a synthetic trachea in a human, since the synthetic trachea had not received EC certification. Such authorisation was not obtained, and the Swedish Medical Products Agency also reported this violation to the police.

Macchiarini’s appointment to Karolinska Institutet and Karolinska University Hospital was in accordance with the strategy of these institutions to develop a centre for advanced airway surgery. It was assumed that regenerative trachea transplantations would be performed no later than three months following Macchiarini’s appointment. The centre’s structure was based on a humanitarian element involving severely ill patients from around the globe, for whom other treatment alternatives had been exhausted, thus receiving experimental treatment without perceiving these procedures as clinical trials. Instead, it was assumed that the surgeries were a matter of medical care for severely ill individuals involving compassionate use, which would not require any official permits. These explanations put forth by Karolinska Institutet and Karolinska University Hospital were rejected by the Swedish investigators.

Considering these key findings by the Swedish investigators, it is appropriate to reiterate what is said in this report in Chapter 2.9. It has not been considered a violation of Article 2 of the European Convention on Human Rights, if a healthcare professional makes an error of judgement in a particular case or makes an error due to miscommunication between healthcare professionals regarding the treatment of a particular patient, thus putting the patient at risk, provided that Member States have taken appropriate measures to ensure high quality healthcare and patient safety. However, since the above-mentioned arrangements meant that the lives of three patients were systematically put at high risk by the strategy of the research institutions in question with regard to research in this area, the committee assesses that it cannot be ruled out that Article 2 of the European Convention on Human Rights has been violated at the Swedish institutions in question. In light of the seriousness of this case, it was considered imperative to investigate whether any errors had been made in Iceland when Andemariam was referred to undergo treatment at Karolinska University Hospital.

8.3. Did Tómas Guðbjartsson have the necessary competency for referring Andemariam to undergo treatment at Karolinska University Hospital?

In an interview with the investigation committee on 24 January 2017, Hlynur Niels Grimsson, a specialist in oncology, stated that at the time he was one of the oncologists on the so-called thorax team. Tómas asked him to contact Karolinska University Hospital, since Hlynur had worked there previously and had good connections to the institution. Hlynur stated that he called a former oncology colleague and received information regarding the surgeon Jan-Erik Juto, whom he did not know. Hlynur then wrote Jan-Erik Juto, inquiring if they had any treatment options for Andemariam. Hlynur received a reply from Jan-Erik Juto,
who referred him to Paolo Macchiarini. Hlynur stated that he also had not heard of Macchiarini before. However, he was pleased that it had been possible to assess treatment options for Andemariam, particularly since the staff at Karolinska University Hospital had much experience in the treatment of rare diseases and complicated surgical procedures. Hlynur then forwarded this email to Tómas, but stated that he did not know exactly how matters continued after that. Hlynur stated that he was not involved in Andemariam's case after 14 April 2011 and did not see him again. He stated that he travelled abroad for several weeks at that time and took his summer holiday shortly after his return. When asked, Hlynur stated that he was not involved in decisions regarding Andemariam's treatment after that. He only received news of Andemariam's surgery in July 2011, while at his summerhouse.

Hlynur's final entry in Andemariam's medical records, dated 14 April 2011, notes the following: "Due to absence abroad of the undersigned, Andemariam will in future be supervised by Tómas Guðbjartsson, thoracic surgeon. Andemariam's medical images and records are being prepared to be sent to thoracic surgeons at Karolinska University Hospital in Stockholm to assess the possibility of surgery there. The case is thus from now on in the hands of Tómas Guðbjartsson."

In an interview with the investigation committee on 18 November 2016, Tómas Guðbjartsson stated that at that point he had taken over responsibility for the patient and had worked on having Andemariam's case evaluated by specialists abroad to determine possible treatment options. This was done in accordance with a resolution by a joint pulmonary pathology meeting, held 17 February 2011.

Based on the above information, and considering the conventions in place at Landspítali University Hospital, as described in Chapters 5.3. and 5.7., the investigation committee assessed that Tómas Guðbjartsson had the necessary competency for referring Andemariam to undergo treatment at Karolinska University Hospital.

8.4. What kind of treatment was Andemariam to undergo at Karolinska University Hospital?

As mentioned above, Macchiarini's appointment to Karolinska Institutet and Karolinska University Hospital was in accordance with the strategy of these institutions to develop a centre for advanced airway surgery. According to Bengt Gerdin's assessment, referred to in Chapter 3, it was likely that a "Patient 1" would turn up sooner or later to be appraised for possible participation in the ongoing development project. It was expected that once this patient surfaced, there would be an acute need for surgery. One of the clinical arguments for developing synthetic trachea transplants had been that the patients who were to undergo this type of medical service would have a "semi-urgent". Thus, when Paolo Macchiarini was contacted from Iceland regarding a patient with the clinical symptoms he had and with a low life expectancy without surgery, it was a situation people were prepared for.

It was expected and intended that regenerative tracheal transplantations should be performed no later than three months after Macchiarini had been appointed to the hospital. When Andemariam was referred to undergo treatment at Karolinska University Hospital, it had been more than half a year since Macchiarini's appointment and he had not carried out any cutting-edge surgical procedures. According to Kjell Asplund's report, the pressure was high when the feasibility of a synthetic trachea transplant in Andemariam's case was being evaluated. Already in his first reply (dated 8 April 2011) to oncologist Hlynur Niels Grimsson's inquiry (dated 6 April 2011), Jan-Erik Juto stated that the world-renowned
"thoracic surgeon", Paolo Macchiarini, would assess the possibility of helping Andemariam 
"perhaps in a rather radical way". Only six days later, Macchiarini discussed the possibility of 
a transplant for Andemariam with Tómas in a phone call.

In his first email, dated 6 April 2011, Hlynur Niels Grímsson clearly stated that Dr. [X] in Boston was consulted regarding possible treatment options Andemariam was in need of in the spring of 2011. Dr. [X] recommended against surgery and instead recommended laser debulking as palliative treatment. Tómas spoke along the same lines in his email to Macchiarini, dated 11 April 2011, in which he clearly stated that it was a matter of opinion "if laser debulking is indicated, or surgery, which I think can be tricky in this particular case". This is, in essence, the question presented to the specialists at Karolinska University Hospital.

Subsequent email correspondence takes place regarding possible and available treatment options and the type of tests and measurements required. This correspondence ends by Tómas asking in an email, dated 20 April 2011, whether it were not advisable to send Andemariam to Karolinska University Hospital "for further evaluation". In the correspondence that followed, requests were made to Landspítali University Hospital for further information regarding Andemariam, such as the results from his lung function test as well as the location and size of the tumour. In his application (dated 9 May 2011) to Icelandic Health Insurance (Sjukratryggingar Islands), regarding the proposed procedures for Andemariam, Tómas states: "Now (early May, 2011), the patient has increasing stridor and is in need of either laser debulking of the tumor (palliative treatment), or possibly curative resection with or without tracheal-transplant." This is the first time, a transplant is mentioned among the proposed treatment options, without further explanation. The inquiry to Icelandic Health Insurance states furthermore: "Professor Paolo Maccherini at the Karolinska Hospital in Stockholm has been consulted and he wants to have the patient over to Stockholm for evaluation." As matters stood, further medical evaluation of Andemariam in Sweden was considered necessary, as well as an evaluation of treatment options. Accordingly, the formal referral of Andemariam to undergo treatment at Karolinska University Hospital, which was sent 11 May 2011 to Dr. Ulf Lockowandt, Senior Physician of Thoracic Surgery, requested the following: "Treatment needed: Evaluation for potential laser debulking of a tracheal tumor or tracheal resection." This indicates that an inquiry was made to Karolinska University Hospital for professional evaluation as to whether laser debulking of the cancer or surgery were possible. Accordingly, a plane ticket to Stockholm for 23 May 2011 was purchased for Andemariam, where he was due to be admitted to the hospital on 24 May. A return ticket was purchased for 27 May of the same year, by which the medical evaluation was to be completed.

It is the opinion of the investigation committee that Tómas Guðbjartsson was aware that Macchiarini and his colleagues were at least considering a trachea transplant as a treatment option for Andemariam before he was admitted to Karolinska University Hospital. The aforementioned phrasing of Tómas' application to Icelandic Health Insurance confirms this, where it is stated: "or possibly curative resection with or without tracheal-transplant."

Written correspondence between Macchiarini and Tómas also provides evidence that Tómas should have suspected that the transplant referred to a synthetic trachea rather than a trachea from a deceased donor. Thus, Macchiarini describes this treatment option in an email to Tómas, dated 15 April 2011, as "a tissue engineered transplant using a new technique via nanomedicine approach". It should, however, be noted that in an interview with the investigation committee on 23 January 2017, Tómas stated that he had not understood the
meaning of this word. In Macchiarini's email to Tómas, dated 20 April 2011, Macchiarini mentions the need for information regarding the size and shape of Andemariam's trachea: "[...] so that we could generate a tissue engineered graft. [...] With this measures we could make a scaffold and eventually use it if primary reconstruction would not be feasible." In an email to Tómas, dated 21 April 2011, Macchiarini discusses "the hypothetical trachea that needs to be implanted". Here, he emphasizes the need to hurry to get the dimensions of Andemariam's trachea: "to get in time the scaffold and the bioreactor." This is reiterated in an email, dated, 3 May 2011, to radiologists Pétur Hannesson and Marianna Garðarsdóttir, of which Tómas received a copy. There, Macchiarini explains the need for the dimensions of Andemariam's trachea in the following manner: "we could implant a bioengineered synthetic grafts but to do so we would need to know all the measures of the native trachea (proximal, distal, etc.) so that we can generate a graft that matches the sizes of the native trachea."

Generally speaking, regulations stipulate that approval by ethics committees are not required for procedures for which evidence-based knowledge in the field of health care services is available. Based on written correspondence with Macchiarini, it must be assumed that Tómas was aware that the surgery constituted a clinical trial, since Macchiarini explained to Tómas in emails, dated 8 May and 12 May 2011, that Macchiarini required certain information from Tómas to apply for a permit from the ethics committee. These emails are included in Chapter 5.4.1.

In interviews with the investigation committee, Tómas denied having been aware that Macchiarini was considering a synthetic trachea transplant, since his workload at the time was particularly high, due to student examinations at the Faculty of Medicine as well as other employment duties at Landspítali University Hospital. Although the investigation committee cannot rule out that Tómas overlooked these details due to his workload, it concludes, nonetheless, that a diligent doctor would have drawn these conclusions while reading the emails Tómas received from doctors at Karolinska University Hospital before Andemariam was admitted there 24 May 2011.

Under these circumstances, the investigation committee believes that a normal response would have been to request further information regarding the procedure, if the information provided in the emails had been unclear. Such an inquiry could have led to questions regarding the type of treatment under consideration at Karolinska University Hospital. Answers to these questions could then have led to a discussion about the desirability of the choice of treatment among specialists in Iceland before the patient travelled to Sweden. It is, however, uncertain, whether such questions and answers would have changed anything regarding the clinical course, especially since the patient had already been admitted to Karolinska University Hospital. In his letter of protest, dated 30 October 2017, Tómas Guðbjartsson strongly rejected the accusation that he had not paid enough attention in his communication with Macchiarini.

The investigation committee, however, also concludes that none of the available evidence in the case indicates that Tómas was aware that the synthetic trachea transplant procedure to be undertaken on Andemariam did not have any of the required official permits, and thus would be in violation of Swedish law and applicable codes of ethics in this field. On the contrary, the aforementioned email correspondence with Macchiarini would have given Tómas legitimate reason to assume that everything was being done to obtain the required official permits.
As mentioned above, Macchiarini requested from Tómas in an email, dated 12 May 2011, to change his description and evaluation of Andemariam's medical history to put more pressure on the ethics committee. The altered text no longer mentioned laser debulking of the cancer as a viable option, rather only traditional surgery, with or without transplantation. The investigation committee assesses that this alteration was hardly in accordance with Article 11 of the Icelandic Physicians Act, No. 53/1988, which was in force at the time, and which states that a physician shall exercise caution and accuracy in issuing certificates and other medical declarations. He/she shall only certify that which he/she knows to be true. The current law contains a similar provision in paragraph 1, Article 19 of the Icelandic Healthcare Practitioners Act, No. 34/2012 (cf. discussion in Chapter 2.5.).

In his letter of protest, dated 30 October 2017, Tómas expresses his doubts about whether the aforementioned changes to Andemariam's referral constitute a violation of Article 11 of the Icelandic Physicians Act, since the document was not a certificate in that sense and Macchiarini had clearly deceived him. The committee considers it necessary to reiterate in this context that Article 11 of the Icelandic Physicians Act not only refers to certificates, but also other medical declarations. This due diligence obligation stipulated by the provisions was undoubtedly intended to minimise the risk that statements made by doctors would be misinterpreted or misused in other ways.

In an interview with the investigation committee on 23 January 2017, Tómas stated he believed, in retrospect, that he should not have complied with Macchiarini's request. What he was trying to do was to pave the way for Andemariam to receive treatment which could save his life. When asked, Tómas also admitted that there had been no reason to exclude laser debulking of the cancer at the time.

Considering the highly unusual ideas expressed in Macchiarini's emails, it is interesting that Tómas does not appear to have consulted with other specialists at Landspítali University Hospital about these emails regarding the treatment options, with which Macchiarini presented Tómas, including the possibility of a synthetic trachea transplant for Andemariam. In his letter of protest, Tómas rejects the notion that he was under any obligation to consult with other doctors in this matter.

### 8.5. Preparation for the synthetic trachea transplantation

As mentioned above, the formal referral of Andemariam to undergo treatment at Karolinska University Hospital, which was sent 11 May 2011 to Dr. Ulf Lockowan dt, requested from Karolinska University Hospital a professional evaluation by specialists as to whether laser debulking of the cancer or surgery were possible. Despite this, Macchiarini seems to almost immediately have gone on to convince Andemariam that a synthetic trachea transplantation was the only possible course of action, which, however, had never been performed on a human anywhere in the world. Only forty-eight hours after admission, i.e. on 26 May 2011, Andemariam signed a declaration of consent to undergo the procedure. He did not return to Iceland on 27 May as planned. An email by Macchiarini to Magnús Páll Albertsson at Icelandic Health Insurance, dated 29 May 2011, states that the "transplant Protocol" for the synthetic trachea transplantation was ready at the time and the electronic document 28 MB in size.

It is quite interesting that an email from Macchiarini to Tómas, dated 12 May 2011, i.e. 12 days prior to Andemariam's admission, states that the place where the "transplant" were to take place had been established as being in Huddinge. This email is included in
Chapter 5.4.1. At that point, both the type of treatment and place for the surgery had been chosen.

Bengt Gerdin's report states that six days before Andemariam was admitted to Karolinska University Hospital, a referral was issued for a PET/CT scan. The referral explained that the purpose of the scan was to determine whether a synthetic trachea could be implanted. Emails, which Jan-Erik Juto sent Tómas five and six days prior to Andemariam's admission also seem to confirm this understanding. These emails are included in Chapter 5.2.1. In the later email, Jan-Erik Juto states that the major surgery (swe: den stora operationen) would be 7 June, i.e. two weeks later. The two weeks were needed to prepare the stem cells (swe: förberedelser av stamceller). In this context, it is important to bear in mind that stem cells were only needed if the intent was to implant a stem-cell-seeded synthetic trachea into Andemariam. Stem cells had not been discussed in connection with other treatment options for Andemariam.

Kjell Asplund's report states that immediately on Andemariam's day of admission, the following had been entered into his medical records at Karolinska University Hospital.

Pat har nu bedömts av Paolo Macchiarini, härvarande ... dent kirurg på kliniken och han skall nu under denna vårtdid bedöma CT-bilder och även PET CT-bilder som skall tas under vårtdiden under 2-3 dagar och bedöma möjlheten till radikal kirurgi vilken planeras med utrymning av tumör och transplantation, med en transplantat polymer med överdragen av patentens egna stamceller. [The patient has now been evaluated by Paolo Macchiarini, the resident surgeon at the clinic. He will now evaluate CT as well as PET CT images, to be taken during the stay over 2-3 days, and the possibility of a radical surgery with the plan to remove the tumour and transplant a synthetic polymer trachea seeded with the patient's own stem cells.]

According to this entry in the medical records, the explicit assumption at Karolinska University Hospital was that Andemariam had been admitted to evaluate the possibility of a synthetic trachea transplant for him.

Judging by Johan Perment's statement, Andemariam's referral to Karolinska University Hospital had been understood differently than the wording of the official referral dated 11 May 2011 gave reason to. Thus, Johan Permert noted that all traditional treatment options had allegedly been tried. The aim of the medical tests and treatment carried out at Karolinska University Hospital had been to evaluate whether preconditions were right for a new type of synthetic trachea transplant, which Macchiarini had developed and said to be effective, and to carry out the transplantation, were those preconditions met. It was said that there was no alternative treatment option to Macchiarini's procedure, neither at Karolinska University Hospital nor elsewhere in the world. Allegedly, Macchiarini, Icelandic specialists as well as specialists at the Division of Ear, Nose and Throat Diseases at Karolinska agreed that the proposed transplant was the only possible treatment option to help the patient. The medical tests Andemariam underwent after his admission to the hospital, had shown that he was an acceptable candidate for the new procedure and that—according to Macchiarini's evaluation—chances were good that the procedure would prove successful.

The investigation committee has no reason to question Johan Permert's statement on how Macchiarini presented Andemariam's case to the hospital, as his description seems to be consistent with available evidence previously discussed. The investigation committee assumes that when Macchiarini presented Andemariam's referral from Landspítal University Hospital to Karolinska University Hospital in the aforementioned manner, he likely referred
to the additions he had asked Tómas Guðbjartsson to make in his referral under the pretence that they were intended for the ethics committee. Macchiarini mentions in an email to Tómas, dated 11 April 2011, that "any reference to a transplant would be appropriate". Due to this, Tómas appears to have added the following text to the referral:

Now (early May, 2011), the patient has increasing stridor and is in need of either laser debulking of the tumor (palliative treatment), or possibly curative resection with or without a trachea-transplant. Professor Paolo Macchiarini at the Karolinska Hospital in Stockholm has been consulted and he wants to have the patient over to Stockholm for evaluation. Preliminary date for surgery or laser treatment is May 24, 2011.

In an email, dated 12 May 2011, Macchiarini once again requested that Tómas change his letter regarding Andemariam's medical history, which had been attached to Tómas' email to Macchiarini from 11 April 2011. These emails are included in Chapter 5.4.1. above. The changes involved replacing the words "Is surgery a possible treatment modality for his patient?" with the following text:

This patient has already exhausted every medical treatment and his only hope of survival and cure is, given that the tumor is only locally invasive and has no regional or systemic metastasis, the resection of the tumor with a safe reconstruction, either via standard airway surgery or using a transplant. I kindly ask you to help us in this difficult case.

After these changes had been made to the documents concerning Andemariam's referral from Landspítali University Hospital to Karolinska University Hospital, the Swedish team of doctors considered itself to have "a proper referral" at hand, as Richard Kuylenstierna, Medical Director of the Division of Ear, Nose and Throat Diseases at Karolinska University Hospital, puts it in his email to Macchiarini, seemingly written around 24 May 2011. In this email, the patient's referral is listed as one of the "obstacles" that had been eliminated. The email appears to indicate that the Medical Director had then felt it was defensible to perform the synthetic trachea transplantation on Andemariam. The entire matter was, however, contingent on Andemariam consenting to undergoing the procedure, which he did on 26 May 2011.

In an interview with the investigation committee on 18 November 2011, Tómas pointed out that whenever patients are sent for evaluation and treatment to hospitals abroad, it is assumed that "evidence-based" treatment options would be involved. He simply trusted that Karolinska University Hospital would solve Andemariam's problem professionally. It were entirely possible that Macchiarini deceived them, but Macchiarini would have to answer for that. Tómas states he first learned that this procedure was on the agenda when Andemariam called him shortly after his admission to Karolinska University Hospital. The news surprised him as much as Andemariam. The doctors at Landspítali University Hospital had not been consulted. Icelandic doctors who knew the patient were also not consulted for a multidisciplinary conference, held at Karolinska University Hospital on 27 May 2011. Tómas states he had been very annoyed over the lack of communication and the fact that he received the news from Andemariam, who also informed him that he would not return to Iceland in accordance with the original plan. At the time, Tómas had not received any reply from Sweden to his emails inquiring about the current status of the case. No reply was received
until Magnús Páll Albertsson, physician at Icelandic Health Insurance, sent a harsh email, asking for clarification and pointing out the terms for Icelandic Health Insurance's obligation to pay. This was done after an invoice in the amount of SEK 300,000 was sent to Icelandic Health Insurance for a pharmaceutical, which was later utilised as a growth factor for the stem cells used to seed the synthetic trachea, which was then implanted in Andemariam.

Considering the above, the available evidence as well as explanations at a later point indicate that Macchiarini deceived Tómas into changing the text of Andemariam's referral under the pretence that these files were intended for the ethics committee. It, therefore, seems clear that the goal was to strengthen the basis for Macchiarini's conclusion that the synthetic trachea transplantation was the only curative treatment option for Andemariam. To prevent misunderstanding, it should be noted that even if the referral had not been changed in the above mentioned way, doctors at Karolinska University Hospital could, nonetheless, have offered Andemariam experimental treatment, provided that all prerequisites of Swedish law were complied with. However, it was later revealed that none of the official permits, required under Swedish law in order to carry out the procedure, had been obtained; cf. Chapter 8.2.

It should be noted that after a patient has been admitted to a hospital abroad, a different doctor takes over as the treating physician. Following Andemariam's admission to Karolinska University Hospital, the legal obligation to inform Andemariam on all aspects of the procedure lay with Macchiarini, Andemariam's treating physician in Sweden. Macchiarini was also under obligation to ensure that all required official permits had been obtained, in accordance with Swedish law, prior to the surgery. In accordance with this understanding of the law, the contract between Icelandic Health Insurance and Karolinska University Hospital, dated 6 June 2011, stated that Karolinska University Hospital required written consent from the patient as well as all appropriate ethical permits. It is also clear that after Andemariam's admission to Karolinska University Hospital, the doctor at Landspítali University Hospital, who referred the patient for treatment, had very limited options for intervening with regard to the patient's treatment, from a legal point of view. He could, for example, not restrict the doctors of the hospital abroad to a specific procedure. From an ethical point of view, however, he was obligated to voice his concerns should he consider the patient's treatment unconscionable. In an interview with the investigation committee on 19 November 2016, Tómas stated that he neither had the necessary information nor knowledge of the proposed surgery, which the specialists at Karolinska University Hospital were preparing, to give him reason to doubt that the procedure was anything but justifiable and in accordance with the law.

There appear to be no provisions in Icelandic law stipulating that the referring physician need to ensure that the treating physician abroad obtains all required permits prior to surgery. Tómas was, therefore, under no legal obligation to do so. Finally, it needs to be reiterated that Tómas' referral did not request experimental treatment, rather an examination and evaluation of possible treatment options, although a "tracheal-transplant" is mentioned as one possibility.

Based on the information given in Chapter 3, the investigation committee concludes that the responsibility for laying the foundation for the establishment of a centre for advanced airway surgery lies with the Board of Directors at Karolinska Institutet and Karolinska University Hospital. The centre's systematic structure was based on a humanitarian element
involving severely ill patients for whom other treatment alternatives had been exhausted, thus receiving experimental treatment without perceiving these procedures as clinical trials. The investigation committee assesses that the responsibility for inviting Andemariam to partake in a clinic trial of this kind lies with the doctors at Karolinska University Hospital. In the same way, they are responsible for all decisions in the organisation and implementation of the procedure. Icelandic doctors had simply not been consulted in the matter. Macchiarini’s requests (outlined above) to receive certain statements from Tómas so that the ethics committee would consider the case appear to have been deceitful, since there was no intent to obtain an official permit from the ethics committee. As stated above, Tómas' statements appear to have been used for an entirely different purpose. Even though Tómas neglected to pay full attention in his communication with Macchiarini and provided statements, which were hardly in accordance with Article 11 of the Icelandic Physicians Act, No. 53/1988, which was in force at the time, the investigation committee cannot assert that he holds responsibility for the synthetic trachea transplantation, since, as noted above, these statements were requested in a deceitful manner.

8.6. How was Andemariam advised regarding the treatment for which he was sent to Sweden and was his written consent obtained?

Andemariam's medical records do not indicate that he was advised on the possible treatment he would receive at Karolinska University Hospital nor regarding other matters which require guidance, despite clear provisions to that effect in Article 5 of the Icelandic Patients’ Rights Act, No. 74/1997. However, the investigation committee has no reason to doubt that Andemariam received advice from both Tómas and Óskar Einarsson, specialist in pulmonary medicine, when Andemariam underwent a bronchoscopy on 12 May 2011. In an interview with the investigation committee on 17 November 2016, Óskar stated that their advice was to ask the opinion of specialists at Karolinska University Hospital regarding Andemariam's treatment options. Tómas made a similar statement in an interview with the investigation committee on 30 March 2017. In his report, Kjell Asplund concludes that Andemariam had not been advised on the possibility of a synthetic trachea transplant in Iceland before he was admitted to Karolinska University Hospital.

In interviews with Óskar Einarsson, on 17 November 2016, and Tómas Guðbjartsson, on 23 November 2016, it was stated that Andemariam wished to go to Sweden for the aforementioned examination. He was unsatisfied with palliative treatment options and wished to see if any curative treatment options were available according to the evaluation of specialists at Karolinska University Hospital.

As far as can be determined, it is not customary to obtain written consent from a patient for sending them to undergo treatment abroad, once a patient has been given the necessary guidance. However, it would appear that when a patient is directly referred from Landspítali University Hospital, such a duty can be inferred from the laws regarding patients' rights. The investigation committee assesses, therefore, that there is reason to reconsider the practices currently in place at Landspítali University Hospital. In this regard, it should be noted that if the laws concerning patients' rights are not complied with, regarding referral of the patient to treatment abroad, then the patient's right to self-determination is violated, since the patient is not given a realistic choice as to whether they wish to go abroad and undergo
treatment available at the hospital abroad. A patient must be able to refuse referral to a hospital abroad before it is made.

8.7. Did Icelandic doctors take part in putting pressure on Andemariam to undergo the synthetic trachea transplant procedure?

It is evident that between 24 and 26 May 2011, Andemariam called Tómas Guðbjartsson to discuss the clinical trial surgery he had been offered. The sources, listed in Chapter 5.10.1. above and discussed in Chapter 5.7., indicate that Tómas considered himself to have very little knowledge about the surgery at that point. The only thing he did was not to discourage Andemariam to undergo the procedure.

Based on the evidence the investigation committee has gathered regarding this aspect of the case, the committee sees no indication that Tómas Guðbjartsson or other Icelandic doctors put pressure on Andemariam to undergo the clinical trial surgery in question. This aspect of the case does, therefore, not warrant any special commentary from the investigation committee.

8.8. Which was the most obvious procedure Andemariam should have undergone in June 2011 and was his referral from Iceland phrased accordingly?

Chapter 5.11. outlines contemporary sources regarding Andemariam's state of health as it was assessed in Iceland before he was sent to Sweden. The same chapter also discusses contemporary sources from Andemariam's Swedish medical records regarding his state of health before he underwent the synthetic trachea transplantation.

It is evident that no biopsy was done, before Andemariam underwent the synthetic trachea transplantation at Karolinska University Hospital, to determine the type and growth rate of the cancer, even though the hospital had a laser device to stop bleeding, should it arise during the biopsy. However, a histological examination of Andemariam's trachea, after it had been removed during the surgery at Karolinska University Hospital, revealed the same type of cancer, which had been diagnosed when Andemariam underwent surgery in Iceland on 29 October 2009, i.e. *Mucoepidermoid carcinoma*, Grade 2 according to the Brandwein grading system. In Iceland, the cancer had been evaluated as "low grade" in accordance with a different grading scale. During our interview with pathologists in Iceland, they stated that the two scales were comparable and that the tumour had likely not become more malignant in June 2011 than when Andemariam underwent surgery in October 2009.

After having gone over all existing images of the tumour from Andemariam's trachea before he underwent surgery at Karolinska University Hospital, the investigation committee assesses that the images confirm the diagnosis made at Landspíttali University Hospital in 2009 of a slow-growing tumour of the type *Mucoepidermoid carcinoma*. The investigation committee considers it significant that the tumour grew so slowly that it took 19 months for it to reach the size which caused significant symptoms in Andemariam following the surgery on 29 October 2009, during which only a part of the tumour was removed. This conclusion should have had a major impact on the decision which treatment option was most desirable when Andemariam was admitted to Karolinska University Hospital, even though no biopsy
was done to determine the type and growth rate of the cancer before the synthetic trachea transplantation was carried out.

If Andemariam's condition had been evaluated at Karolinska University Hospital such that it was considered an urgent matter, then it is the assessment of the investigation committee that there was a strong argument for following the recommendation of the best specialists in Boston in the Unites States of America by doing a palliative "laser debulking" procedure, thus gaining more time to assess the patient's condition. "Laser debulking" might have been sufficient to improve Andemariam's breathing for many months. The procedure could potentially have been repeated several times, since the tumour was extremely slow-growing. Following "laser debulking", it would also have been possible to assess other treatment options, once more was known about the extent and histological type of the tumour.

Andemariam underwent the synthetic trachea transplantation, since he had been told that this procedure could cure him and was the only curative treatment option available. Unfortunately, many cancer treatments are palliative. Nonetheless, patients can live a long life with these types of treatments, particularly when the tumour is slow-growing and non-metastatic, as in Andemariam's case. Doctors need to be able to advise their patients about realistic treatment options in each case. When it comes to difficult or unusual cases, it is important to seek advice from doctors in all specialities which could be applicable. It is striking that in this particular case, oncologists in Iceland and at Karolinska University Hospital did not have any input regarding the conclusion that a synthetic trachea transplantation should be carried out. No other surgeons or pulmonologists in Iceland were consulted regarding this decision. The decision was made by Macchiarini, who convinced Andemariam of the desirability of this procedure forty-eight hours after Andemariam's admission to Karolinska University Hospital.

The information above clearly indicates that Tómas Guðbjartsson's referral of Andemariam to Karolinska University Hospital, dated 9 May 2011, which included "Evaluation for potential laser debulking of a tracheal tumor or tracheal resection" was reasonable in light of the views outlined above. Even though Tómas added later on "to assess whether a transplant was a viable option", it should be reiterated that Tómas' referral stipulated for Andemariam to return to Iceland three days after the doctors in Sweden had made an evaluation. Upon his return, it would be decided which treatment option was most suitable in Andemariam's case, before sending him back to Sweden to undergo that procedure. However, Landspítali University Hospital never got a chance to assess this evaluation, since Andemariam—urged on by Macchiarini—signed a declaration of consent to undergo the synthetic trachea transplantation, forty-eight hours after his admission to Karolinska University Hospital.

8.9. Why did Tómas Guðbjartsson take part in the synthetic trachea transplant surgery, and were his statements in the media regarding his role in the procedure sufficiently precise?

In an interview with the investigation committee on 28 March 2017, Lilja Stefánsdóttir, who at the time was the Chief Executive of the Department of Surgery, stated that Landspítali University Hospital paid Tómas' salary and covered his travel expenses for the synthetic trachea transplantation.
In a conversation with the investigation committee on 18 November 2016, it was stated that Tómas assisted Jan Liska, one of the leading Scandinavian cardiac surgeons, in opening Andemariam. Macchiarini was then responsible for implanting the synthetic trachea.

Since Tómas had sutured Andemariam's surgical incision after the dramatic surgery Andemariam underwent on 29 October 2009, it does not seem unusual that he was asked to assist with opening Andemariam again during the surgery at Karolinska University Hospital on 9 June 2011. A different issue is that after having assisted with the surgery in this limited manner, reports by the media implied that Tómas had been an active participant in Macchiarini's team in carrying out the synthetic trachea transplantation and was involved in the procedure in other aspects as well.

In a conversation with the investigation committee on 18 November 2016, it was stated that Tómas assisted Jan Liska, one of the leading Scandinavian cardiac surgeons, in opening Andemariam. The committee based its assessment in this case on this explanation by Tómas. In his letter of protest, dated 30 October 2017, however, Tómas Guðbjartsson makes an entirely different statement. There, Tómas states that he "was highly involved in the surgery". He was involved in opening Andemariam, which was very complicated due to adhesions between the sternum and heart following the 2009 surgery as well as radiation therapy. Then Jan Liska and Tómas, who were the chief surgeons, worked on removing the tumour together with Macchiarini, who, however, was often otherwise occupied, such as with preparing the synthetic trachea away from the operating table. Tómas stated, moreover, that he also sewed on the left bronchus of the synthetic trachea and sutured the patient's surgical incision together with Karl H. Grinnemo. He was thus "significantly and to a higher degree than most others" involved in the surgery. Tómas confirmed that he was not involved in extracting stem cells from Andemariam's iliac crest, 48 hours before the surgery. He stated, however, that he stood next to Jan-Erik Juto when the latter removed mucous membrane from Andemariam's nose to attach it to the synthetic trachea, as this was done during the same surgery during which the tumour was removed and the synthetic trachea was implanted. He, therefore, did not consider it unreasonable to use the term "we" about those parts of the surgery, as he was without doubt part of the surgical team. According to Tómas, surgical procedures today are generally considered a team effort rather than the work of an individual and the same applies to discussions about such surgeries. Tómas stated that he was not involved in decisions regarding the construction or appearance of the synthetic trachea, but measurements taken in Iceland were partly used to fabricate the transplant in London. Tómas denies having made "misleading comments" regarding his involvement in the procedure, even though he admits that he could have been more precise in his statements.

In Tómas' statements, as they were made public by the media and which are discussed in Chapter 5.18.1., some aspects of Tómas' role in the surgery are misrepresented. Thus, Tómas said during the news magazine and talk show Kastljós: "...two days before the surgery, we extracted bone marrow from Andemariam's anterior superior iliac crest to collect stem cells. [...] and then we implanted this new synthetic trachea into Andemariam". In the television series "The stem cell and its secrets" (ice: Stofnfruman og leyndardómar hennar), which was broadcast on TV on 28 November 2012, Tómas said: "Two days before the surgery, we extracted marrow from Andemariam, bone marrow, by putting a needle into the iliac crest. Then we took these stem cells and put them in a box [...]. This box contained the synthetic trachea, which we intended to implant and which we had tailored exactly to his size..."
The stem cells which we harvest from bone marrow are actually highly unspecialised and don't know into what kind of cell they should grow when they are put onto the synthetic material. It is necessary to give them a signal telling them into what type of cell they should grow. We did that by taking some of the mucous membrane from Andemariam's throat, small patches, which we removed very carefully by cauterisation. Then we attached these patches in several places on the synthetic trachea."

Even if Tómas' statements in his letter of protest regarding his involvement in the synthetic trachea transplantation are used as the basis for this investigation, it is clear that Tómas neither participated in extracting stem cells from Andemariam nor applying them to the synthetic trachea. Lastly, Tómas neither actively participated in removing mucous membrane from Andemariam's throat, nor in attaching it to the synthetic trachea, even if he "stood next to" the doctor, who carried out these procedures.

The investigation committee thus concludes that Tómas made misleading comments in public about the procedure when he used the word "we" in connection with certain aspects of the process, in which he did not participate. It should be reiterated at this point that Tómas was not an official participant in the clinical trial according to a research protocol or other agreements. Even though professors may need to simplify their language for the public when appearing in the media, they must, nonetheless, ensure that they do not take credit for the work of others. These misleading statements regarding the clinical trial, inevitably lead to the fact that in the public debate it was unclear what role Tómas had played during the procedure, when news was received that none of the necessary official permits for carrying out the surgery had been obtained.

8.10. Was the aftercare Andemariam received at Landspítali University Hospital satisfactory?

Since Tómas Guðbjartsson had participated in the synthetic trachea transplant procedure, the investigation committee does not consider it necessary to remark on the fact that he was the treating physician for Andemariam's aftercare at Landspítali University Hospital.

Based on what is stated in Andemariam's medical records from Landspítali University Hospital, no other conclusions can be drawn than that the aftercare he received was satisfactory. This applies to all types of treatment he required for his health. He was admitted for investigations shortly after showing symptoms requiring a medical assessment. He also received good and high-quality care when he was admitted for urgent treatment. Various doctors at Landspítali University Hospital also wrote necessary prescriptions for him even though he was not hospitalised. The only conclusion is, therefore, that the staff at Landspítali University Hospital contributed to ensuring that the patient received satisfactory treatment at Landspítali University Hospital following the synthetic trachea surgery.

Considering that, upon his return to Iceland, Andemariam received very little to no information nor any summary letter outlining the treatment he had received at Karolinska University Hospital, his aftercare went better than was to be expected. In this regard, it was helpful that Tómas Guðbjartsson was frequently in contact with the doctors at Karolinska University Hospital to obtain information about the treatment the patient had received. At the same time, Tómas also frequently contacted Andemariam himself regarding information about what had been done in Sweden, particularly when the flow of information from Sweden was slow.
In general, it can be said that Tómas Guðbjartsson went out of his way to keep in touch with Andemariam and paid close attention to Andemariam's state of health following the procedure. This is evident from innumerable emails and text messages (SMS) which Tómas sent Andemariam as well as phone conversations, which are referred to in these emails and messages. The speed with which Tómas responded to Andemariam's concerns regarding his health is another indication. Tómas was also quick to treat Andemariam or ensure he was treated by other doctors or admitted when needed. When more serious health problems arose in Andemariam's case, Tómas was quick to contact Karolinska University Hospital and ask for assistance or further medical treatment there. He also wrote the necessary referrals and called to speed things up. Tómas appears to have tried everything in his power to ensure that Andemariam received good aftercare following the surgery.

It should also be mentioned that in an interview with Tómas on 30 March 2017, it was stated that the nursing staff and other staff members at Landspítali University Hospital went out of their way to help Andemariam, both with regards to his regular treatment, but also in other more practical matters, such as helping out when Andemariam could not afford expensive pharmaceuticals.

Andemariam's aftercare at Landspítali University Hospital was in reality far more difficult than it needed to be, since Karolinska University Hospital seems to have been unwilling to comply with the cost sharing agreement, which was made on 6 June 2011 and which is described in Chapter 5.5.1. Moreover, the doctors in charge at Karolinska University Hospital continued to be rather reluctant to receive Andemariam for treatment. After Macchiarini left his position at Karolinska University Hospital, it was at times extremely difficult for the doctors in Iceland to send Andemariam for necessary treatment to the hospital in Sweden. In an interview with the investigation committee on 29 March 2017, Tómas stated that he got the impression that nobody really knew who was responsible for Andemariam's treatment at the Swedish hospital following the trial surgery which was performed on him on 9 June 2011. Tómas said Andemariam was very annoyed by the reluctance of Karolinska University Hospital and that it was not in accordance with what had been discussed with him when he underwent the trial surgery in question. In an email, dated 12 October 2013, which Tómas wrote to Lotte Orre, Ulf Lockowandt and Jan-Erik Juto, and of which he sent a copy to Philipp Lars Lundell and Magnus Nilsson, Tómas told the Swedish doctors about Andemariam's feelings. At the end of the email, Tómas expresses the following: "[Andemariam] is hopeless and depressive. He is very disappointed about how long this is taking. He feels exploited and wants to talk to the media, something I do not think is of any help for neither Karolinska or my institution. We have to move faster. Otherwise, I am afraid this will have a sad ending. I want him transferred to KS before it is too late."

8.11. The friendship between Tómas and Andemariam

In an interview with the investigation committee on 18 November 2016, Tómas stated that he came to know Andemariam in connection with Andemariam's surgery, which he underwent 29 October 2009. Tómas had been called in when severe bleeding occurred during the surgery, as explained in more detail in Chapter 5.2. above. Tómas said that they got along well after that, and one of the reasons was that Tómas' father is a geologist and knows Ingvar Friðleifsson, then Director of the United Nations University Geothermal Training Programme, very well. Gylfi Páll Hersir, who was Andemariam's Master's thesis supervisor, also knew Tómas' father.
Gylfi Páll Hersir stated in an interview that it was clear that Tómas held almost daily contact with Andemariam. He both called Andemariam on the phone and sent him emails. Tómas made great efforts to pave the way for Andemariam in many regards. Þórhildur Ísberg, School Manager at the United Nations University Geothermal Training Programme, made similar statements. Andemariam received very good services at Landspítali University Hospital, and Tómas Guðbjartsson was particularly involved in every regard.

Merhawit, Andemariam's wife, stated in an interview that Tómas and her husband had become good friends. When asked, she said that Andemariam had been satisfied with the services he received at Landspítali University Hospital. Merhawit thought that Tómas had done everything in his power for Andemariam until the day Andemariam was last admitted to Karolinska University Hospital in October 2013. Tómas fought for Andemariam to be regularly seen at Karolinska University Hospital, where he could receive better treatment than at Landspítali University Hospital.

Based on the above statements and additional evidence in the case, it can be concluded that a friendship had formed between Tómas and Andemariam. Due to this, Tómas worked relentlessly to help Andemariam, far beyond his employment duties as a doctor. For example, Tómas raised money from companies so that Andemariam's family could come to Iceland. Tómas also assisted in ensuring that Andemariam's wife and his two sons would be permitted to visit Andemariam in Iceland by writing and calling the Embassy of The State of Eritrea in Sweden as well as the authorities in Eritrea. In this context, it must be stated that it is extremely difficult for people from Eritrea to get permission from the authorities to travel abroad. Tómas also worked hard on ensuring that Andemariam would keep his residence permit for Iceland by corresponding repeatedly with the Directorate of Immigration. In retrospect, this certainly prolonged Andemariam's life, since it was impossible to receive specialist services in Eritrea. Tómas also helped to procure residence permits for Andemariam's family members. Finally, Tómas went above and beyond his employment duties when he personally took it upon himself to accompany Andemariam from Karolinska University Hospital to Landspítali University Hospital, and this is likely not everything that could be told.

Even though civil servants are disqualified from exercising official authority or making administrative decisions in the affairs of their friends, in accordance with Section II of the Icelandic Administrative Procedure Act, this generally does not refer to doctors providing health services for their friends. This conclusion, however, is dependent on the presumption that the work is done objectively and that the quality of the health services provided is not affected negatively. This underlying premise is, for example, described in Article 10 of the Codex Ethicus of the Icelandic Medical Association, where it is stated that doctors must keep in mind that close personal relationships with a patient can affect their judgement and professional independence.

The investigation committee assesses that there is no evidence to suggest that Tómas Guðbjartsson's friendship with Andemariam had a negative effect on the quality of Andemariam's aftercare. However, the investigation committee also assesses that it cannot be ruled out that Andemariam was in a weak position and had little chance of denying Tómas' wish to undergo the scientific tests, which were carried out at Landspítali University Hospital in connection with the drafting of a scientific article, which was published in *Lancet* 2011.
These scientific tests are discussed in Chapter 5.15. These tests included, for example, bronchoscopies, which Tómas knew Andemariam disliked. In his letter of protest, dated 30 October 2017, Tómas rejects the committee's viewpoint in this matter.

8.12. In general, was information regarding Andemariam's treatment entered into his medical records in accordance with the Icelandic Health Records Act?

In accordance with Article 6 of the Icelandic Health Records Act, all information necessary with respect to the patient’s treatment shall be systematically entered into the patient's medical records. But in all cases, the following minimum information shall be entered, as applicable:

1. Patient's name, address, ID number, profession, marital status and next of kin.
2. Date of consultation or admission and discharge.
3. Reason for consultation or admission.
5. Alerts, e.g. regarding allergies.
6. Examination.
7. Description of treatments/procedure, including information on medication and opinions of consultant specialists.
8. Test results.
9. Diagnosis.
10. Outcome and plans for further treatment.

Patient referrals to foreign hospitals are documented in Landspítali's electronic patient records by completing a specific referral document that includes the logo of the Icelandic Health Insurance (Sjúkratryggingar Íslands). According to information from the Chief Medical Officer at Landspítali, the original referral for Andemariam to Karolinska University Hospital was documented in this way, in the electronic medical record on May 11th 2011. Interestingly, the changes that were made to the referral on the 11th and the 12th of May 2011 were not entered into Andemariam's medical record. The next nine referrals of Andemariam to Karolinska University Hospital were also not entered into his medical record, but in as far as it can be discerned he went to Karolinska University Hospital for the following treatments: [Medical records deleted]

It is striking that in all instances when Andemariam returned for aftercare to Landspítali University Hospital after having undergone procedures at Karolinska University Hospital, he was never provided with a *formal summary letter* from his doctors at Karolinska University Hospital, describing Andemariam's condition and the treatment he received as well as other information Icelandic doctors required to make correct decisions with regard to his aftercare.

According to the above, the following is therefore lacking: basic information regarding the Icelandic doctors' evaluation of Andemariam's state of health as well as what kind of procedures were deemed necessary each time he was referred to Karolinska University Hospital, as well as information from Karolinska University Hospital regarding their doctors' evaluation of Andemariam's state of health as well as what kind of procedures were carried out each time. This lack of information in the medical records makes it difficult,
and at times impossible, to get a clear picture of the medical treatment Andemariam received based on his Icelandic medical records.

Referrals to hospitals abroad are generally entered into a patient's medical record (so-called Saga system). To do so, it is necessary to fill in a special form marked for Icelandic Health Insurance. Since it was decided in Andemariam's case that Landspítali University Hospital would provide his aftercare, even though the clinical trial surgery as well as other procedures had been carried out at Karolinska University Hospital, it is the opinion of the investigation committee that it would have been absolutely necessary to include such referrals in Andemariam's Icelandic medical records. Similarly, it was necessary to receive summary letters from Karolinska University Hospital regarding Andemariam's treatment there and enter the information into his Icelandic medical records, to ensure the necessary foundation was there to make decisions regarding his aftercare at Landspítali University Hospital. It falls outside the purview of the investigation committee to further discuss the neglect of the doctors at Karolinska University Hospital to issue summary letters describing the treatment Andemariam received at the hospital, when he was sent back to Landspítali University Hospital. The investigation committee, however, assesses that Tómas Guðbjartsson and—as appropriate—the CEOs at Landspítali University Hospital should have made formal requests for such summary letters. The investigation committee has, however, no reason to doubt that Tómas made such requests in conversations with Macchiarini as well as emails to him, dated 27 November 2012 and 23 February 2013, without success. It did not help that communication was made difficult by the doctors at Karolinska University Hospital. These circumstances made it extremely difficult for Icelandic doctors to provide Andemariam's aftercare, since they had to rely on unofficial communication about what treatment he had received at Karolinska University Hospital each time. In this context, it is worth reiterating that no "clinical trial protocol" was issued by the Swedish doctors at Karolinska University Hospital regarding Andemariam's aftercare.

As described in more detail in Chapter 5.2., Dr. [X] at Massachusetts General Hospital in Boston was consulted. His final assessment that a so-called laser debulking procedure would be the best course of action in Andemariam's case was not included in Andemariam's medical records, even though this assessment was the basis for Andemariam's initial referral to Karolinska University Hospital. It is the opinion of the investigation committee that this assessment should have been entered into the medical records, with reference to item 9, Article 6 of the Icelandic Health Records Act.

Andemariam's medical records from Landspítali University Hospital show shortcomings in other regards, but the investigation committee does not consider it necessary to discuss these in more detail, with the exception of one instances, from which lessons can be learned and which will be discussed in the next chapter.

The letter of amendment from Landspítali University Hospital, dated 27 October 2017, states that there are special mandatory classes for students at the University of Iceland's Faculty of Medicine and again during the internship year at Landspítali University Hospital, which focus on laws pertaining to medical records and healthcare. These classes strongly emphasise the importance of knowing these and other laws pertaining to healthcare services and to follow these laws in all respects. The fact that doctors do not enter information in medical records in accordance with existing laws is, therefore, a far more substantial issue than the rules and procedures in place at Landspítali University Hospital. In recent years, Landspítali University Hospital has placed increasing emphasis on the importance of medical
record entries, such as by implementing a hospital policy regarding medical records, the issuance of special regulations for doctors' entries, and by appointing a special editorial team for medical records as part of the Hospital's quality department. The following documents are brought up in this context: 1. The policy on doctors' medical record entries (ice: Stefna um skráningu lækna í sjúkraskrá) - see attached file, originally from 2015 (under review). 2. The appointment of the editorial team for medical records, appointed 2012 and re-appointed 2017. 3. The Hospital's medical records policy (LSH-129, ice: Stefna Landspitala um sjúkraskrá), and 4. The Hospital's medical records handbook (LSH-062, ice: Sjúkraskrá Landspitala - handbók).

8.13. Video recordings of Andemariam's bronchoscopies, which were performed on 16 August and 20 October 2011 at Landspitali University Hospital

As further discussed in Chapters 1.4 and 2.5 above, it can be stated—in a somewhat simplified way—that statutory patient/doctor confidentiality prohibits healthcare staff from sharing or using information which should be kept confidential and of which they become aware in their work about a patient's health, condition, diagnosis, prognosis and treatment, and other personal information, whether accidentally or on purpose. A breach of confidentiality may also occur when a healthcare professional does not take appropriate measures to prevent confidential information from being communicated without authorisation. This duty of confidentiality thus includes that unauthorised individuals are generally not permitted to be present during medical procedures, let alone to record such procedures for distribution to the public.

In accordance with the unwritten principles of administrative law on confidentiality, both paragraph 2, Article 13 of the Icelandic Patients' Rights Act, No. 74/1997 and paragraph 2, Article 17 of the Icelandic Healthcare Practitioners Act, No. 34/2012, state that the patients' or their guardians' consent is needed to release a healthcare professional from the duty of confidentiality.

According to the above, the doctor who led the bronchoscopy was not permitted to allow video recording of the procedure for a public TV broadcast without Andemariam's informed consent. Since this is a clear exception to the duty of confidentiality, the doctor was required to ensure that proof of consent was available. The burden of proof that such a declaration of consent was given lies with the doctor. For a third person to be allowed to be present during a medical procedure and record it digitally, it was unavoidable to obtain an informed and unambiguous written declaration of consent, in accordance with item 7, Article 2 of the Icelandic Act on the Protection of Privacy as regards the Processing of Personal Data, No. 77/2000. To ensure that proof of consent exists, doctors generally scan the written declaration of consent in these cases and save the scan to the patient's medical records.

Since Óskar Einarsson was in charge of and led the bronchoscopies, performed on Andemariam on 16 August and 20 October 2011, it was his responsibility to obtain a declaration of informed consent from Andemariam before the procedures were recorded on video. However, Óskar explained in a statement, given to the investigation committee on 27 March 2017, that he did not believe unauthorised individuals were present during the procedure, since everyone present was a staff member of Landspitali University Hospital. The investigation committee does not consider that this explanation can be dismissed. It is
obvious that the misunderstanding regarding the recording was due to the fact that Ásvaldur Kristjánsson, from the Health and Information Technology Department at Landspítali University Hospital, was also working for an unauthorised party in connection with the production of a TV programme which he and Elin Hirst were involved with, a fact that appears to have been unbeknown to Óskar. To prevent a misunderstanding, Ásvaldur should have made Óskar aware of the fact that he was also working for people outside Landspítali University Hospital at the time of the recording. Since Ásvaldur neglected to do this, there was no reason for Óskar to assume that the aforementioned regulations regarding informed consent and its entry into the medical records applied.

In a response given on 10. October 2017, Ásvaldur states that he had never been informed of the above compulsory notification obligation to his supervisors at Landspítali University Hospital. He was, therefore, extremely surprised by the investigation committee's discussion of this regulation.

The letter of amendment from Landspítali University Hospital, dated 27 October 2017, states that the regulations regarding video recordings at the hospital have been changed. Thus, the principle rule is now that video recordings are prohibited at the hospital, cf. the Regulations on video and audio recordings at Landspítali University Hospital (LSH-130, ice: Reglur um mynd- og hljóðupptökur á Landspítala).

8.14. Was Andemariam dragged in front of the media to publicise the synthetic trachea transplantation?
When the article "Tracheobronchial transplantation with a stem-cell-seeded bioartificial nanocomposite: a proof-of-concept study" was published in *Lancet* on 24 November 2011, the University of Iceland issued a press release. The release mentions Andemariam's name and details about his personal life and state of health. The press release can be read in many different ways, but it was no doubt important for the University of Iceland to mention that an article had been published in a prestigious scientific journal and that one employee of the University had been amongst the authors as well as to explain the subject matter of the article. That is in itself quite normal. What was not normal, however, was to reveal the name of the patient in the press release, even if he was a student at the University of Iceland. It has generally not been the custom of the University of Iceland to reveal the names of patients in press releases regarding health-care-related articles. The investigation committee believes that staff members of the University of Iceland have played a role in dragging the patient in front of the media without sufficient regard for him as a patient and student at the University of Iceland. Tómas, as a staff member of Landspítali University Hospital as well as the patient's doctor, should have realised that Andemariam was in no position to refuse his requests to speak with the media, whether Andemariam was in favour of such requests or not. At that point, Andemariam was dependent both on Landspítali University Hospital with regard to his aftercare and on the University of Iceland with regard to his studies. He was, therefore, in an extremely difficult position to refuse requests to speak with the media or release information to the media. Both institutions and their staff members should have paid particular attention to these circumstances when decisions were made that affected both a patient at Landspítali University Hospital and a student at the University of Iceland.
Due to the above information, the investigation committee concludes that Andemariam was dragged in front of the media by the University of Iceland to advertise the *Lancet* article to the media.

8.15. **Internal investigation of the case at Landspítali University Hospital**

After Bengt Gerdin's misconduct report regarding Macchiarini's papers was published in May 2015, Andemariam's case and the roles Tómas Guðbjartsson and Óskar Einarsson played in this case were discussed at Landspítali University Hospital. It was decided to carry out a limited investigation of Andemariam's case. The aim was to review Andemariam's treatment at Landspítali University Hospital and assess whether it had been acceptable. This procedure is in accordance with the open safety policy being implemented at Landspítali University Hospital. The letter from Landspítali University Hospital particularly emphasises that there was no actual root cause analysis (RCA), but that the committee was established to carry out an *internal investigation*.

It should be noted that the term 'root cause analysis' does not appear in the committee's formal statement of duties, dated 31 July 2015, nor in the report, submitted 1 October 2015. Even though Torfi Magnússon and Elin Hafsteinsdóttir did not consider themselves to be carrying out a root cause analysis, it nonetheless appears that the CEOs at Landspítali University Hospital were wrongfully under the impression that this were the case. This is, for example, apparent in media coverage of this investigation at Landspítali University Hospital. The committee assesses that the investigation was a typical internal audit. Its legal authorisation and connection with other control systems is discussed in Chapter 1.3.

The reason why the results of the internal investigation did not reveal any additional shortcomings with regard to Andemariam's treatment at Landspítali University Hospital is that it was primarily based on Andemariam's medical records. As has been shown above, however, entries in Andemariam's medical records were highly insufficient. For this reason, the committee assesses that the investigation should ideally also have included a very detailed discussion with those doctors at Landspítali University Hospital, who were involved in Andemariam's treatment.

It is interesting that the results of the investigation were neither discussed at a meeting with the Head of the Cardiothoracic Surgery Department nor sent to him, even though he had initiated discussions about this matter and recommended an investigation. The results were also not send or presented to Óskar Einarsson.

It may also be noted here that numerous employees at Landspítali University Hospital from various divisions were involved in Andemariam's treatment between 2009-2013. An investigation of a patient's medical records may, therefore, cause attention and possibly unrest amongst staff members who worked with the patient. An open discussion at Landspítali University Hospital about what was being investigated and the results of the investigation would likely have appeased hospital employees and the work environment. It should be noted that the main conclusion of the investigation is that there was a greater need for entering information regarding the patient's referral for treatment abroad into the medical records. This issue affects most doctors at the hospital and possibly other employees, such as secretaries.
8.16. Was it necessary to obtain permission from the National Bioethics Committee as well as Andemariam's informed consent to carry out the tests performed on Andemariam at Landspítali University Hospital in connection with the writing of the scientific article, which was published in Lancet?

In 2011, the following provisions in the Icelandic Patients' Rights Act, No. 74/1997 were in force with regard to scientific research in the health sector: paragraph 4, Article 2; Article 10; paragraph 3, Article 15; and Article 29. On the basis of the last-mentioned article, the Minister issued the Regulations on Scientific Research in the Biomedical Field, No. 286/2008, which applies to all types of research in this field with the exception of pharmacology studies.

The issue which the committee investigated was whether the blood samples, CT scans, flexible bronchoscopies, and spirometries, which Andemariam underwent at Landspítali University Hospital between September and October 2011, should have been considered scientific research, since the results were discussed in the scientific article "Tracheobronchial transplantation with a stem-cell-seeded bioartificial nanocomposite: a proof-of-concept study" (published electronically in Lancet on 24 November 2011), or whether these tests were merely done as part of a data-based study (retrospective study), which relied on available data without providing new information, which led to an intervention for Andemariam.

Generally speaking, a retrospective study is solely based on health data contained in medical records, which has been obtained previously from a patient's medical treatment. This type of study, therefore, does not involve the patient's active participation. Scientific research (on human subjects), on the other hand, involves taking special measurements as part of the research which involve patient intervention.

At the time the tests on Andemariam were carried out, the term 'scientific research' was defined as follows: "Research carried out in order to increase knowledge, which inter alia makes it possible to improve health and cure diseases." Even though more stringent regulations have been set forth by the Icelandic Act on Scientific Research in the Health Sector, No. 44/2014, the criteria used to distinguish between retrospective studies and scientific research on human subjects do not appear to have changed.

Communication between Tómas and Macchiarini clearly indicates that the aforementioned tests were carried out per Macchiarini's request and in connection with the writing of the scientific article, which was published in Lancet. For example, Macchiarini writes in an email to Tómas, dated 3 August 2011, which is described in Chapter 5.15.1. above:

I had a conformation about the high interest that the NEJM has in considering our paper. To increase the changes to get it accepted, we would need the blood and biopsies samples listed in the attached file. Especially the blood samples would be of extreme importance since they will be compared to the perioperative blood samples. We should need to have them by the end of next week. Is this please possible? Just let me know please?

According to a document, attached to the above email, Tómas was supposed to send "Heparin-blood samples (as much as you can)" and "Biopsies from the native bronchi and graft" to Philipp Jungebluth at Karolinska Institutet. "Non-heparinized blood", on the other hand, was to be sent to the Arbeitsgruppe Prof. Tomas Lüdde at Universitätsklinikum Aachen in Germany.
Tómas also sent Macchiarini or his assistants CT images a number of times. At least some of these images were potentially intended for publication in the scientific article. Thus, Tómas sent CT images by email on 26 August 2011, 10 October 2011, and 12 October 2011. The final email states the following:

"Here are some CT pictures you can look at. Tell me which ones you like. I have not heard from you regarding my email yesterday. I hope everything is going well." Seventeen images were attached to the email.

In connection with the writing of the scientific article, Andemariam underwent a special spirometry test, cf. the following email exchange between Tómas and Philipp Jungebluth:

On 23 October 2011, Philipp wrote Tómas: "Hej Tomas. Do you think you will get a new lung function test tomorrow? Because otherwise the post-op test is [worse] than the pre-op? Please find attached the current version. I would like to send Paolo my last version within the next few hours so he can work on it also." [Medical records deleted]

Based on the above, Andemariam underwent blood sampling, CT scans, flexible bronchoscopies (during which tissue samples were taken), and spirometries at Landspítali University Hospital to obtain medical information, explicitly for the purpose of using this information for the writing of the scientific article, which was published electronically in *Lancet* on 24 November 2011. Considering the interventions these tests entailed, for the benefit of scientific research intended to enhance knowledge in the field of medicine, the investigation committee assesses that there can be no doubt that the tests constituted *scientific research*, as defined in paragraph 4, Article 2 of the Icelandic Patients' Rights Act, which was in force at the time. The investigation committee assesses that the fact that some of these tests may also have been used later on with respect to Andemariam's treatment does not affect this conclusion. Accordingly, doctors were not allowed carry out these tests without prior consent from the patient. This consent should have fulfilled the requirements set forth in Article 10 of the Icelandic Patients' Rights Act, No. 74/1997. Moreover, *permission from the National Bioethics Committee* should have been obtained, since the project constituted a collaborative project with doctors from Karolinska University Hospital, cf. paragraph 1, Article 5 of the Regulations on Scientific Research in the Biomedical Field, No. 286/2008, as well as paragraph 4, Article 2 of the Icelandic Patients' Rights Act, No. 74/1997, which was in force at the time.

In light of the aforementioned written correspondence with Macchiarini and his colleagues, the committee believes that it should have occurred to Tómas Guðbjartsson that there was reason to investigate whether the tests, which were conducted on Andemariam at Landspítali University Hospital in connection with the writing and publication of the scientific article, required a permit. The case may be different for Óskar Einarsson. He was not included in the correspondence and there is no indication that he was aware of these emails. He only carried out Andemariam's bronchoscopies. Considering the information he had, it cannot be ruled out that from his point of view these bronchoscopies were a normal part of the Swedish doctors' monitoring of Andemariam's condition.
The members of the investigation committee do not think they have reason to believe that Tómas circumvented the aforementioned regulations intentionally. To learn from these mistakes, the investigation committee attempted to determine what would have led the doctors involved to believe that the tests did not constitute scientific research which required a permit. The committee believes that the primary reason was that most scientific research projects conducted in Iceland are group studies, rather than single-subject studies. Another factor which may have misled him—in the opinion of the investigation committee—was that when patients are sent to Sweden to undergo a lung transplantation, it is part of the aftercare "protocol" to send information and data comparable to Andemariam's case. In these cases, however, this is done as part of the medical treatment of the patients and not as part of a scientific research study.

The committee, furthermore, believes that it is necessary to reiterate that even if a permit from an ethics committee in Stockholm had been obtained (which was not the case, cf. Chapters 3.3. and 3.4.) for the clinical trial surgery carried out on Andemariam in Sweden and its aftercare, this permit in itself would not have sufficed to permit the aforementioned scientific tests conducted on Andemariam at Landspítali University Hospital. This would have required a separate permit from the National Bioethics Committee and Andemariam's consent in accordance with the Icelandic Patients' Rights Act, No. 74/1997, which was in force at the time, and general conflicts of law rules. This regulation is today clearly explained in paragraph 1, Article 2 of the Icelandic Act on Scientific Research in the Health Sector, No. 44/2014, which states, for example, that these laws apply to scientific studies carried out, in whole or in part, in Iceland.

8.17. Treatment of personal data as well as blood and tissue samples taken in connection with the scientific research tests Andemariam underwent at Landspítali University Hospital

According to paragraph 3, Article 15 of the Icelandic Patients' Rights Act, No. 74/1997, which was in force at the time, the Data Protection Authority was authorised, in accordance with the Act on the Protection of Privacy as regards the Processing of Personal Data, to grant access to information from medical records, including biological specimen, for the purpose of scientific research, provided the research fulfils the conditions set forth for scientific research, cf. paragraph 4, Article 2. Such a permit could be bound by those conditions which were deemed necessary each time. In practice, the Data Protection Authority generally issued such permits on the condition that patients gave their informed consent to grant research access to their medical records. The declaration of consent needed to meet the requirements set forth in item 7, Article 2 of the Icelandic Act on the Protection of Privacy as regards the Processing of Personal Data, No. 77/2000.

Such a permit, to access Andemariam's medical records in connection with the scientific research tests, which were the basis for the scientific article published in Lancet on 24 November 2011, was not applied for with the Data Protection Authority. It was also not entered into Andemariam's medical records that his records had been accessed as part of a scientific research project, as required under paragraph 4, Article 15 of the Icelandic Patients' Rights Act, No. 74/1997, which was in force at the time, cf. now paragraph 3, Article 27 of the Icelandic Act on Scientific Research in the Health Sector, No. 44/2014.

Since permits from the Data Protection Authority and the National Bioethics Committee as well as the informed consent of the patient had not been obtained, none of the
prerequisites set forth by law to carry out the scientific research tests discussed in the previous chapter were met.

It is mentioned in Chapter 5.16.1. that information regarding Andemariam's state of health was sent to Macchiarini's private home in Barcelona, Spain, per Macchiarini's request. In this connection, it shall be stated that even if the aforementioned permits had been obtained, sending information about Andemariam's state of health to Macchiarini's private home would still have violated the main principles relating to data quality and processing of the Icelandic Act on the Protection of Privacy as regards the Processing of Personal Data, No. 77/2000, as well as security regulations regarding the transmission of health data. During both scientific research and the treatment of patients, it must be ensured that the destination where data is being sent is appropriate and valid and meets the security requirements to receive and preserve such information.

8.18. Participation of Icelandic doctors in the scientific article about the synthetic trachea transplantation published in *Lancet*

As described in more detail in Chapter 6.5.1., the investigation committee based its review of whether Tómas Guðbjartsson and Óskar Einarsson acted professionally and scientifically by participating in the writing of the article "Tracheobronchial transplantation with a stem-cell-seeded bioartificial nanocomposite: a proof-of-concept study" on the assumption that the specified primary findings of the scientific article were consistent with what they knew to be true and correct with regard to Andemariam's health, according to the tests they had done at Landspítali University Hospital, before the article was published.

The investigation committee concludes that the description of Andemariam on page 1999 of the scientific article, where it is stated that he "has an almost normal airway" does not correspond with the information and test results Tómas Guðbjartsson and Óskar Einarsson had about Andemariam's state of health when the article was submitted to *Lancet*. The same applies to the statement made in the article that Andemariam was asymptomatic four to five months after surgery.

It is clear that Tómas and Óskar did not have access to the pathology results of a tissue sample taken on 16 August 2011, nor other pathology results from Karolinska University Hospital, but they had reportedly been told that a healthy mucous membrane had been detected in this sample. The committee does not call into doubt the truthfulness of their statement that they were given incorrect information regarding the pathology results and they are not held responsible for this.

It can be said in Tómas Guðbjartsson's favour that he tried to tone down the exuberantly positive statements about Andemariam's recovery. He welcomed the peer reviewers' comments and suggested more time should be spent on working on the scientific article. His suggestion received little attention. He did not succeed in ensuring that the information in the scientific article was in accordance with the test results of the bronchoscopies, clinical condition, and adverse reactions Andemariam experienced following the surgery and of which Tómas and Óskar were aware. Tómas had, however, sent Macchiarini and his assistant Philipp Jungebluth all relevant results of the tests carried out on Andemariam at Landspítali University Hospital and had specifically raised the issue of adverse effects and other health problems Andemariam experienced after the procedure. At
that point, Tómas and Óskar had only one acceptable and ethical choice, which was to decline further participation in writing the article and withdraw their names from the list of co-authors. This they did not do. For this reason, their role as co-authors of the aforementioned scientific article cannot be considered to meet the quality requirements set forth for research scientists.

It should be noted that Tómas' and Óskar's decision to remain co-authors of the scientific article, despite the aforementioned shortcomings, was made at a time when they considered themselves to be *highly* dependent on Macchiarini for Andemariam's aftercare, since it became clear at the time that it was necessary for Andemariam to receive treatment at Karolinska University Hospital on a regular basis, and they considered Macchiarini to be the only specialist who could help with his treatment. This dependency may certainly have limited the extent to which they believed they could negotiate with Macchiarini with regards to the scientific article, so that Andemariam's aftercare would not be jeopardised.

As explained in more detail in Chapter 8.15., the investigation committee assesses that it would have been necessary to obtain a permit from the National Bioethics Committee to carry out the tests which were conducted on Andemariam at Landspítalí University Hospital in connection with the writing of the scientific article published in *Lancet*. Since such a permit was not obtained, the article was unpublishable in this recognised scientific journal.

Tómas Guðbjartsson and Óskar Einarsson wrote to *Lancet* on 24 February 2017, requesting their names be removed from the article "Tracheobronchial transplantation with a stem-cell-seeded bioartificial nanocomposite: a proof-of-concept study" published 10 December 2011. The reason they gave was that Swedish reports about the surgery revealed that neither Macchiarini nor Karolinska University Hospital had obtained a permit from an ethics committee for the procedure. It is noteworthy that when this report was prepared for publication, *Lancet* had not yet honoured Tómas' and Óskar's request.

8.19. Symposium of the University of Iceland on the occasion of the first anniversary of the first synthetic trachea transplantation

On 9 June 2012, the University of Iceland held a symposium on the occasion of the first anniversary of the first synthetic trachea transplantation. The committee investigated whether the administrators at the University of Iceland were aware of the legal and ethical shortcomings in connection with the synthetic trachea transplantation when the decision was made to hold the symposium. The committee assesses that based on available evidence and interviews, conducted as part of the investigation, there is nothing to indicate that the management of the University of Iceland was aware of the legal and ethical shortcomings of the clinical trial surgery, which Andemariam underwent in Sweden, when the decision was made to hold the symposium in Iceland. This conclusion is also consistent with the events in Sweden, where Bengt Gerdin's report quickly triggered a public debate about the nature of the procedure and the need for official permits. This report was, however, only submitted to the Rector of Karolinska Institutet on 13 May 2015.

The committee also investigated whether Tómas Guðbjartsson's paper at the symposium discussed the complications Andemariam struggled with as a result of the surgery, so that the outcome of the procedure was depicted correctly. In an interview with the
investigation committee on 23 January 2017, Tómas stated that he discussed the complications Andemariam struggled with as a result of the surgery in his lecture at the symposium. He did not depict the case as a "success story". On the contrary, he explained that he considered it his role to learn from mistakes. Therefore, he had not misled anyone.

In light of the investigation, the committee considered it appropriate to find out first whether recordings from the symposium existed. There was no recording of Tómas Guðbjartsson's presentation and only the first 20 minutes of Macchiarini's speech had been recorded. Tómas' lecture at the symposium is, furthermore, not available in print. However, the slides which Tómas used during his presentation are available. Information on one of the slides suggests that Tómas at the very least discussed the formation of granulation tissue at the anastomotic sites of the main bronchus as well as infections, which Andemariam frequently suffered, in his lecture. However, the committee lacks clearer and more detailed information about the topic of the lecture in order to determine whether all adverse effects and health problems resulting from the surgery—as discussed in Chapters 5.14. as well as 6.5.2.1. to 6.5.2.5.—were brought up and whether the discussion went into enough depth to depict the end results of the surgery correctly. Since this necessary information is missing and cannot be obtained, the conditions were not in place to allow the committee to thoroughly investigate this aspect.

The committee, moreover, investigated whether it would have been right for Andemariam to attend the symposium himself. The contemporary sources listed in Chapter 7.2. and especially Tómas' emails to Macchiarini, dated 6 March and 11 March 2012, clearly show that Tómas believed that it would increase Andemariam's chances and that of his family to receive an extension on their residence permits if Andemariam was in the spotlight of the Icelandic media. Tómas, therefore, emphasised that Andemariam should attend the conference. The committee does not doubt that this was indeed Tómas' opinion at the time, based on the aforementioned sources. Whether his assessment was correct, however, is another matter. During that time, other and far more ambiguous laws regarding various aspects concerning foreign nationals were in force than today, i.e. the Icelandic Act On Foreigners, No. 96 /2002. According to paragraphs 1 and 2, Article 12 f of these laws, it was permissible to grant a foreign national a residence permit if there were pressing humanitarian reasons for so doing or due to their special connection with the country or if a foreign national could demonstrate an urgent need for protection, e.g. for health reasons, or due to the difficult social circumstances of the person concerned or due to difficult general circumstances in the person's home state. After having reviewed the laws and their implementation, the investigation committee assesses that it can neither substantiate nor deny that Tómas's assumption was justified. As mentioned in Chapter 5.20.2., the committee agrees with Tómas that it undoubtedly prolonged Andemariam's life that he received a residence permit for Iceland, which Tómas helped him obtain, since specialist services were unavailable in Eritrea, as previously stated.

The investigation committee assesses that, regardless of the aforementioned views, the most important aspects to be considered when deciding on Andemariam's participation in the symposium, were Andemariam's state of health as well as the ethical viewpoint to avoid dragging a patient in front of the media and to protect their privacy and right to self-determination. Andemariam suffered from haemoptysis during the first part of May 2012. For this reason, he was admitted to Karolinska University Hospital on 21 May 2012. There, granulation tissue was removed from the anastomotic sites of both the left and right main
bronchus. The tissue on the right side was far larger in size. Then a stent was placed. The hospital discharged him on 24 May 2012. Tómas wrote Andemariam on 28 May 2012, asking him how he was doing. Andemariam replied the next day, saying "Not better yet". He also asked to receive antibiotics. Considering how Andemariam felt at this point and how many times he had appeared in the media, it would have been sensible to decide against Andemariam's participation at the symposium, which was held 9 June 2012. Even though Andemariam's health improved somewhat as the symposium drew closer, he had been quite sick for some time, which was reason not to ask him to attend.

Finally, the committee investigated whether it was right for Tómas to connect Andemariam with the media personnel, which Harvard Bioscience Inc. (the manufacturer of the synthetic trachea) had hired to film the symposium for their own advertising purposes. The questions this media staff asked Andemariam and his answers can be found in Chapter 4.4.

Icelandic doctors are generally quite conscious and leery to let pharmaceutical manufacturers interact with their patients. There has been an ongoing debate, for many decades, about how doctors should maintain their independence from pharmaceutical manufacturers and should protect their patients' privacy. The investigation committee assesses that the same should apply for manufacturers of medical equipment intended for transplantations, mutatis mutandis. In light of the aforementioned views, the committee believes that it is highly controversial that Tómas acted as an intermediary, taking the questionnaire to Andemariam and pressing him to answer it. In this context, it is important to keep in mind that the company, in its own capacity, was preparing to advertise itself as a manufacturer of synthetic tracheae, and Tómas pressed Andemariam to answer the questionnaire because the company had donated the synthetic trachea which had been implanted into Andemariam. In doing so, Tómas put inappropriate pressure on Andemariam to help the company by answering the questionnaire.

In his letter of protest, dated 30 October 2017, Tómas Guðbjartsson stated: "The report states that I acted as an intermediary, taking Susan Forman's questionnaire to A. In retrospect, my actions were misguided. Nonetheless, I want to clarify that I had absolutely no intention of advertising Harvard Bioscience, and I had never had any connection with this company."

8.20. Recommendations of the committee
The Letter of Appointment of the investigation committee did not specifically request recommendations for improvements as a result of the investigation of this case. Nonetheless, the committee allows itself to point out three major issues, which need to be addressed, in addition to those issues subject to possible decision-making regarding a change in working procedures.

1) As stated in Chapters 5.15. and 8.15., a permit from the National Bioethics Committee should have been obtained for the tests conducted on Andemariam at Landspítali University Hospital in connection with the writing of the scientific article published in Lancet 2011. The investigation committee assesses that it is desirable for Landspítali University Hospital to ask the National Bioethics Committee to provide guidelines, outlining the differences between retrospective studies and scientific research on human subjects, to ensure that there is no doubt about what kind of study is involved each time healthcare professionals at Landspítali University Hospital prepare their research protocols.
2) Interviews, conducted by the investigation committee with Kristján Erlendsson, doctor at Landspítali University Hospital and current Chair of the National Bioethics Committee, as well as Henry Alexander Henrysson, Adjunct Lecturer in Philosophy at the University of Iceland, specialist at the Centre for Ethics and current Deputy Chair of the National Bioethics Committee, revealed that The Icelandic Act on Scientific Research in the Health Sector, No. 44/2014, has the shortcoming that the National Bioethics Committee does not have enough authority to intervene in scientific research projects for which a permit has not been obtained, cf. Article 29 of the Icelandic Act on Scientific Research in the Health Sector, No. 44/2014.

The investigation committee assesses that representatives of Landspítali University Hospital and the University of Iceland need to raise this issue with the applicable Minister, drawing attention to these serious shortcomings of the aforementioned laws.

3) As explained in Chapter 2.9., Article 2 of the European Convention on Human Rights has been clarified such that in the case of a patient's death at a healthcare facility, it must be possible to seek independent and impartial arbiters, i.e. a court, to determine the victim's cause of death and to right these wrongs, by awarding compensatory damages where applicable.

Even though Andemariam received good aftercare at Landspítali University Hospital (cf. Chapter 8.9.), the committee assesses that the way in which scientific research was conducted on Andemariam at Landspítali University Hospital as well as how his personal data was handled in connection with the scientific article, published in Lancet (cf. Chapters 8.15. and 8.16. above), need to be reprimanded. The committee, therefore, thinks it is appropriate for Landspítali University Hospital to consider offering Andemariam's widow financial support, enabling her to hire a lawyer to review whether there is liability for compensation. The reason for this is that there is no comparable case in Iceland, which is why Landspítali University Hospital should show special initiative in helping Andemariam's wife and his three sons to bring this case to a just and successful close. In this context, it shall be mentioned that it is rather surprising that Andemariam's widow informed the Chair of this committee that Karolinska University Hospital has not been in contact with her to review its possible liability for the mistakes made in Andemariam's case, which are included in the Swedish investigation report, as explained in Chapter 3.