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THE QUALIFICATION AND TRAINING OF LASER HAIR REMOVAL OPERATORS WITHIN SOUTH AFRICA

A dissertation submitted to the

Faculty of Health Sciences, University of Johannesburg,
As fulfilment for the Master's Degree in
Somatology by

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Supervisor: _____________________ - 2018
Prof. Nicolette Houreld Date

Co-Supervisor: _____________________ - 2018
Dr. Nicole Brooks Date
DECLARATION

I, Mandy Merle Thomas declare that this dissertation titled “The Qualification and Training of Laser Hair Removal Operators within South Africa” is my own, unaided work, unless where acknowledged. It is being submitted for the Degree of Master of Technology in Somatology, in the Faculty of Health Sciences at the University of Johannesburg, Johannesburg. It has not been submitted before for any degree or examination in any other University.

________________________________________
Mandy Merle Thomas

___________ day of _________________________
ABSTRACT

Laser hair removal therapy has become a popular treatment option for long-term depilation. The word LASER is an acronym for Light Amplification by Stimulated Emission of Radiation. Light energy is absorbed by specific chromophores (targets) in the skin such as melanin, haemoglobin, water, tattoo ink and collagen. In the case of laser hair removal, the chromophore is melanin, i.e. the pigment found in hair. The emitted light is primarily absorbed by the hair shaft melanin. The light energy converts to intense heat energy which destroys the hair follicle and its bulb (Ibrahim et al., 2011). Lasers are classified from Class 1 through to Class 4, according to the potential harm that the laser beam can cause. Class 4 lasers are typically used for medical and therapeutic treatments such as laser hair removal. These lasers are powerful medical devices and can cause skin burns, scarring and pigmentedary changes if equipment is not used correctly. Other associated hazards include occupational exposure to the laser plume which are the vapours, smoke, and particulate debris that is produced during a laser hair removal treatment. The laser plume is known to be carcinogenic (cancer causing) and a teratogen (an agent that may disturb the development of an embryo or foetus). The wide range of devices and applications require profound knowledge in order to provide patients with safe and effective treatment strategies (Bodendorf et al., 2013). Therefore, sufficient training and regulations are needed to limit complications.

In the United States of America, Arizona was the first state that required a specific number of mandatory training hours in order to legally perform light based treatments for hair removal. Candidates are required to complete practical training of 24 hours that is supervised by a health professional or by a laser technician who has a minimum of 100 hours of practical experience per procedure. There should be 24 hours of practical supervision of laser and intense pulsed light (IPL) devices used (Arizona Revised Statutes, 2014). In Texas, it is required that laser hair removal technicians perform at least 100 laser hair removal procedures under supervision (Texas Department of Licensing and Regulation, 2017). In Florida, candidates are required to complete a 30 hour continuing education course approved by the Electrolysis Council, and a minimum of five hours practical experience in laser and light based devices. Candidates are required to pass the Society for Clinical and
Medical Hair Removal examination to acquire certification as a Certified Medical Electrologist. Once certified, the electrologist must operate under the direct supervision of a trained physician (Florida Department of Health, 2014). In other countries where mandatory hours are not a prerequisite, there are regulatory boards governing laser hair removal operators that perform laser hair removal procedures. South Africa does not have any form of regulation and standardisation in training of this type of treatment. This lack of regulation and standardised training poses a risk of injury to the public.

The purpose and aim of this study was to investigate the qualifications and training in laser hair removal therapy in South Africa. Information was gathered from a wide spectrum of participants from the Health and Skincare industry and medical professions. The first survey questionnaire was compiled and aimed at clinic owners/managers in South Africa that offer laser hair removal therapy. The content of the survey questionnaires was aimed at acquiring information on the impact of existing training that was obtained by laser hair removal operators. The second survey questionnaire was compiled and aimed at manufacturers that supply laser hair removal devices in South Africa, to obtain the theoretical and practical hours offered, as well as the content allocated to perform laser hair removal therapy. The third survey questionnaire was specifically aimed at laser hair removal operators currently in the workplace, to obtain data about their qualification and the type of laser hair removal training received. Lastly, the fourth survey questionnaire was compiled and aimed specifically at accredited tertiary institutions to obtain information about the theoretical and practical hours, the content allocated to perform laser hair removal therapy, as well as their opinion on the current regulations surrounding laser hair removal therapy in South Africa. The survey questionnaire comprised of mostly closed-ended questions designed to gather information regarding qualification, laser hair removal training, and opinions of current legislation and regulation of laser hair removal operators. For this study, 196 electronic survey questionnaires were distributed by the researcher, of which 122 electronic survey questionnaires was completed by November 2017.

The results of the survey completed by the owners/managers of laser hair removal clinics showed that 90% felt that there should be more emphasises on laser hair
removal training at tertiary institutions, and a significant amount (86.11%) indicated that additional laser hair removal training was required after the student completed their tertiary studies. According to the feedback given, 66.67% of additional training is provided by the manufacturer of laser devices. Information gained from manufacturers of laser hair removal devices, indicated that half (50%) of the respondents did not require any form of formal qualification as a minimum requirement to be trained on laser hair removal procedures and devices, therefore anyone without any NQF level can be trained to use these devices. Understanding the physiological process of laser treatments, as well as the science and physics behind the practical procedures, requires a higher order of thinking which involves analysing, evaluating, problem solving and critical thinking. According to the survey results, manufacturers are performing theoretical and practical examinations, however it holds no formal value and passing these examinations is not recognised in industry.

Laser hair removal operators currently in the workplace that have completed the survey (60.87%) felt the amount of training on laser hair removal from their tertiary institution was insufficient. Possible reasons for this outcome is that only 1 to 5 hours theoretical training on laser hair removal was received, and the majority of respondents (46.40%) had no practical training on laser hair removal, as it was not provided for by the tertiary institution. The results of the survey also indicated that 42.86% of laser hair removal operators currently in the workplace have no prior experience working with laser devices.

The accredited tertiary institutions that participated in the study indicated that 72.22% of these institutions do not offer laser hair removal training. Of the 27.78% of tertiary institutions that do offer training, half (50%) do not offer a practical examination in laser hair removal to measure the level of competency of the students. Respondents (100%) felt that the industry should have standard requirements in terms of minimum practical and theoretical hours in relation to laser hair removal training. The respondents strongly agreed (83.33%) that the regulation of laser hair removal services by an established regulatory board would help to create unified standards that would apply to all laser hair removal operators.
Placing inexperienced hands on a laser device could result in injury to a client, which can lead to traumatic experiences for both parties involved. There is an unmistakable need for the industry to be regulated, with mandatory training hours and standards to be set out for high at-risk procedures, such as laser hair removal.
DEDICATION

To everyone who played a role in my studies. Your contribution, loving support and encouraging words will always be greatly appreciated. Thank you so much.

Firstly, I would like to dedicate this research to my father, who has been there every step of the way, my biggest and greatest supporter and secondly, I would like to dedicate this research to my son with faith, dedication and hard work great things will always be achieved.
ACKNOWLEDGEMENTS

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<table>
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<th>Description</th>
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<tr>
<td>‘P’ standards</td>
<td>Prescribed Techniques and Prescribed Technologies</td>
</tr>
<tr>
<td>BMLA</td>
<td>The British Medical Laser association</td>
</tr>
<tr>
<td>CE</td>
<td>Conformité Européene</td>
</tr>
<tr>
<td>CIDESCO</td>
<td>Comité International d'Esthétique et de Cosmétologie</td>
</tr>
<tr>
<td>CIBTAC</td>
<td>Confederation of International Beauty Therapy and Cosmetology</td>
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<tr>
<td>CPC</td>
<td>Condensation Particle Counter</td>
</tr>
<tr>
<td>CPD</td>
<td>Continued Professional Development</td>
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<tr>
<td>CQC</td>
<td>Care Quality Commission</td>
</tr>
<tr>
<td>CTS</td>
<td>Connective root or tissue sheath</td>
</tr>
<tr>
<td>FDA</td>
<td>Food and Drug Administration</td>
</tr>
<tr>
<td>HIW</td>
<td>Health Inspectorate Wales</td>
</tr>
<tr>
<td>HIS</td>
<td>Healthcare Improvement Scotland</td>
</tr>
<tr>
<td>ILS</td>
<td>Intense light source</td>
</tr>
<tr>
<td>IPL</td>
<td>Intense Pulse Light</td>
</tr>
<tr>
<td>IRS</td>
<td>Inner root sheath</td>
</tr>
<tr>
<td>LASER</td>
<td>Light Amplification by Stimulated Emission of Radiation</td>
</tr>
<tr>
<td>LED</td>
<td>Light emitting diodes</td>
</tr>
<tr>
<td>LLLT</td>
<td>Low-level laser therapy</td>
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<tr>
<td>Nd:YAG</td>
<td>Neodymium-doped yttrium aluminium garnet</td>
</tr>
<tr>
<td>NIR</td>
<td>Near infrared</td>
</tr>
<tr>
<td>NQF</td>
<td>National Qualification Framework</td>
</tr>
<tr>
<td>NVQ</td>
<td>National Vocation Qualification</td>
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<tr>
<td>ORS</td>
<td>Outer root sheath</td>
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<tr>
<td>PBM</td>
<td>Photobiomodulation</td>
</tr>
<tr>
<td>PCOS</td>
<td>Polycystic ovary syndrome</td>
</tr>
<tr>
<td>RHC</td>
<td>Radiation Health Committee</td>
</tr>
<tr>
<td>RQIA</td>
<td>Regulation and Quality Improvement Authority</td>
</tr>
<tr>
<td>SAAHSP</td>
<td>South African Association of Health and Skincare Professionals</td>
</tr>
<tr>
<td>TRT</td>
<td>Thermal relaxation time</td>
</tr>
<tr>
<td>UFP</td>
<td>Ultrafine particles</td>
</tr>
<tr>
<td>VTCT</td>
<td>Vocational Training Charitable Trust</td>
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LIST OF DEFINITIONS

Hirsutism
Defined as the abnormal growth of terminal hair in women that grows on male-pattern (androgen dependent) body sites, e.g. the face and chest.

Hypertrichosis
Defined as excess hair growth at any site of the body that is not dependent on androgen.

Thermal relaxation time
Defined as the time taken for 50% of heat energy to be conducted away from target tissue.

Joules
Defined as the standard unit of measurement for work or energy and refers to the amount of delivered photons.

Fluence
Defined as the total energy delivered per unit area and is measured in joules per centimetre squared (J/cm²).

Pulse duration
Defined as the amount of time the laser energy is applied, which is usually measured in milliseconds (ms).

Fitzpatrick skin Types
Defined as skin typing test; or Fitzpatrick phototyping scale) to determine the numerical classification schema for human skin colour.

Laser plume
Defined as the vapour, smoke and particle debris that is produced during a laser treatment.

Laser hair removal operators
Refers to all personnel that provide a laser hair removal procedure.

Credit system
Defined as a systematic method of describing an educational programme by assigning credits to its components. Credit measures the volume of learning required for a qualification.
National qualification framework

National qualification framework (NQF) is a comprehensive system approved by the Minister for the classification, registration, publication and articulation of quality-assured national qualifications. The NQF is the set guidelines and principles by recording the learner’s achievement.

High school diploma

High school diploma or National Senior Certificate is the main school-existing certificate in South Africa, commonly known as the matriculation certificate (NQF 4).

One year certificate in skin care therapy (NQF 4)

Further Education and training certificate in the basic skills in beauty therapy and nail technology (NQF 4). The purpose of the qualification is to develop the foundational competencies required for a career in the beauty profession.

Two year Certificate in skin care therapy (NQF 5)

This qualification is primarily vocational, or industry oriented. It provides the student with introductory knowledge and practical techniques in the beauty profession.

Three year college level Diploma in skin care (NQF 5 or 6)

The qualification provides career-oriented training that will prepare the student to deliver quality practice in the health and skin care industry. Vocational diploma programmes typically include simulated work experience or work integrated learning (WIL).

Three year university Diploma in skin care therapy (NQF 6)

This qualification develops graduates to demonstrate comprehensive knowledge and skills in the health and skin care industry. After obtaining the National Diploma, graduates may enrol for a Bachelor of Technology (BTech) degree as stipulated by the University.
**Four year Bachelor’s degree in skin care therapy (NQF 7)**

Bachelor’s degrees refer to the first degree qualification in the health and skin care industry. This degree has a higher volume of learning and cognitive demand. It also prepares the student to become a member of a multidisciplinary team that works together with medical doctors, plastic surgeons, dermatologists, dieticians and physiotherapists.

**Master’s degree in skin care (NQF 8 or 9)**

A master’s degree enables students to develop advanced applied research competencies within the health and skin care industry. Students partaking in the Master’s programme will be required to conduct research, and write and present a full dissertation under the guidance of a supervisor/s.
PUBLICATIONS EMINATING FROM THIS STUDY


CHAPTER ONE
INTRODUCTION

1.1 Problem Statement
Laser hair removal is one of the more popular minimally invasive cosmetic procedures performed on a daily basis by laser operators, however the laser apparatus is a powerful device with the potential to cause harm if used incorrectly. The incorrect use of laser hair removal devices can increase the risk of patient complications which include burning of the skin resulting in scars, pigmentary changes, infections, reticulate erythema, post treatment erythema, oedema, ocular complications, pain and purpura, associated with malpractice of laser hair removal treatments (Vano-Galvan and Jaen, 2009). Appropriate training and a registered qualification is vital to understand the risks and effects of lasers on various skin types, and the condition being treated to ensure proper treatment management (Consultation Regulatory Impact Statement, 2015). To reduce the risk of the public to injury, there should be some type of regulatory board and mandatory training hours.

In the United Kingdom, healthcare professional’s operating laser hair removal devices are required to register with the Department of Health’s Care Quality Commission (CQC) (Town and Brown, 2017). In the United States of America, states such as Arizona, Florida and Texas requires mandatory training hours under supervision to ensure the safety of clients (Arizona Revised Statutes, 2014; Florida Department of Health, 2014; Texas Department of Licensing and Regulation, 2017). In South Africa, one of the concerns regarding laser therapy is that there are no standardised training and qualification requirements to perform these treatments. Unfortunately, there is no legislation dealing with the purchase and supply of laser devices. In other words, anyone with a sufficient amount of money can purchase a laser device, even with poor or no qualifications or experience. Most suppliers may offer non accredited or informal training of two to four days. If the suppliers were offering accredited training, the duration of the course should be at least 100 hours (practical and theory) according to the South African Association of Health and Skincare Professionals (SAAHSP) (Crichton, 2012).
The lack of any form of regulation and qualification is problematic. The increase in growth of the Health and Skincare industry that offers laser hair removal therapy without any formal educational requirements poses a great injury risk to the public. Regulation will enforce the required knowledge and practical skills under a standardised licencing board exam administered by an established recognised tertiary institution.

1.2 Purpose and Objectives of the Study
The purpose and aim of this study was to investigate the qualifications and training in laser hair removal therapy in South Africa. In pursuit of this aim, the following research objectives were identified:

- To obtain information from laser clinic owners/managers in South Africa on the impact of existing training received by laser hair removal operators.
- To determine the theoretical hours, practical hours and theoretical content allocated for training in laser hair removal by manufacturers that supply laser devices in South Africa.
- To determine the type of laser hair removal training received by laser hair removal operators currently in the workplace.
- To determine the theoretical hours, practical hours and theoretical content allocated for training in laser hair removal by accredited tertiary institutions in South Africa.

1.3 Importance of the Study
With the rapid increase and demand for laser hair removal therapy, there appears to be a lack of information about the minimum training requirements in terms of theoretical and practical education in South Africa. In order to promote these standards, it is necessary to establish the current status quo of theoretical and practical training performed by training institutions and the industry at large. The outcomes of the study is to create an awareness of the exiting practices, and where applicable suggest recommendations that may assist in standardisation, regulation and public protection associated with laser hair removal therapy in South Africa.
CHAPTER TWO
LITERATURE REVIEW

2.1 Hair Anatomy
The hair strand is a natural fibre made up of keratin, a protein comprising of a high concentration of sulphur arising from the amino acid cysteine. The main physical properties of human hair generally depend on the location on the human body. It is characterised by its elasticity, smoothness, volume, shine and softness, as well as movement control (Velasco et al., 2009).

2.1.1 Hair structure
Human hair is made up of two distinct structures, namely the follicle and the hair shaft (Figure 2.1). The hair follicle is located under the skin and anchors the hair, while the hair shaft is the non-living part located above the skin.

![Image of human hair structure](image-url)

Figure 2.1 Human hair (Erdoğan, 2017).

The hair bulb forms the base of the hair and is comprised of cells, namely keratinocytes. These cells have the highest proliferation rate among cells in the human body. In addition to this, the hair bulb contains specialised cells, the melanocytes, which produce the pigment melanin that provides colour to the hair.
fibres (Cruz et al., 2016). Joined to the hair bulb, lies an onion-like structure, called the dermal papilla also referred to as the follicular papilla. The dermal papilla is an important component of the hair follicle that plays key roles in morphogenesis and regeneration, including determining the thickness, length and hair cycle of the hair itself (Veraitch et al., 2017). The hair shaft acts and assists as a sensory organ, a protective device, and a container for sequestering and excreting unwanted compounds (Stenn and Paus 2001). The hair shaft has three focal components, namely the medulla, cortex and the cuticle. The medulla is a loosely packed, disorganised region close to the core of the hair surrounded by the cortex, which contains the key part of the fibre mass, mainly consisting of keratin and essential lipids (Yang et al., 2014). The majority of the hair fibres are made up of the cortex. It is composed of cortical cells, which are elongated cells enclosing melanosomes containing eumelanin (brown-black pigment) and/or pheomelanin (red pigment), responsible for the hair colour. The cortex also gives the hair tensile strength (Cruz et al., 2016). Surrounding the cortex is the outermost layer, namely the cuticle. The cuticle is formed by flat overlapping cells in a scale-like formation (Robbins, 2012). These cells are approximately 0.5 µm thick, 45–60 µm long and found at 6–7 µm intervals (Robbins, 2012). The cuticle provides protective properties and acts as a barrier against physical and chemical insult (Erdoğan, 2017).

The hair follicle is a multi-functional structure, which includes immunological and physical protection against external insults; it has thermoregulatory properties and sensory perception. The hair follicle renews itself during a hair cycle throughout the entire life of an individual to continuously produce new hairs (Welle and Wiener, 2016). The follicle is the vital growth structure of the hair, and the histological structures include the connective root or tissue sheath (CTS), outer root sheath (ORS) and inner root sheath (IRS) (Figure 2.2). The CTS covers the hair follicle externally and is connected to the dermis. The ORS is known as a reservoir of stem cells which is involved in cell differentiation and cell proliferation. It also contains keratinocytes and melanocytes which help to support hair growth and the IRS, and follows the hair fibres up to the opening of the sebaceous gland (Oshima et al., 2001; Lai-Cheong and McGrath, 2013). The IRS is comprised of three layers, namely Henle’s layer, Huxley’s layer and a cuticle layer (Figure 2.2). The cuticle layer connects to the cuticle of the hair shaft, anchoring the hair shaft to the follicle. IRS
cells produce keratin and trichohyalin. These proteins act as an intracellular cement that strengthens the IRS for it to support and mould the growing hair shaft (Randall and Botchkareva, 2009).

2.1.2 Hair growth

The three concurrent phases of hair growth (Figure 2.3) starts with active growth known as the anagen phase, where cells of the bulbar matrix develop rapidly into the hair shaft, and the hair lengthens. This phase can last 1-6 weeks, depending on the location of the hair on the body (Table 2.1) (Dhurat and Deshpande, 2010). The anagen phase is considerably high in its metabolic action among the matrix keratinocytes that produce the hair fibre and inner root sheath (Brajac et al., 2014). During the anagen phase, hair shaft synthesis and melanin production (hair pigment) is abundant. It ends with a highly controlled involution of the hair follicle resulting in apoptosis and terminal differentiation (Lindner et al., 1997). The second transitional phase of growth and development is known as the catagen phase, and it lasts for a few weeks depending on the location on the body and type of hair (Randall and Botchkareva, 2009). The first sign of catagen is the termination of melanogenesis in the hair bulb resulting in a cessation of melanin production (Erdoğan, 2017).
Keratinocytes cease proliferation, resulting in shrinkage of the hair follicle. The papilla then detaches from the hair bulb, cutting off the blood supply from the hair strand. As a result the hair shaft is pushed upwards. Apoptosis of epithelial cells occurs in the bulb and ORS (Lindner et al., 1997; Brajac et al., 2014).

Figure 2.3 Changes in hair growth cycles are associated with hair disorder development. (a) Changes to the hair growth cycle can occur such that the duration of anagen is truncated, yielding in a brief production of short and fine hair fibres. (b) Equally, changes to the hair growth cycle can involve a prolongation of the resting telogen phase, after the hair from the previous growth cycle is shed (c) (McElwee and Sinclair, 2008).
A resting period, known as the telogen phase, ensues and lasts for a few weeks (eyelashes) to eight months (scalp hair) (Randall and Botchkareva, 2009). The follicle is reactivated by intrafollicular and extrafollicular signals. The unpigmented hair often remains attached to the hair canal (Milner et al., 2002). Telogen hair follicles are characterised by a lack of pigment-producing melanocytes and an IRS (Randall and Botchkareva, 2009). The hair will fall out at the end of the telogen phase. After a few weeks, stem cells from the bulge area are stimulated and the hair follicle re-enters the anagen growth phase (Wosicka and Cal, 2010).

Follicle stem cells are stimulated at the telogen-to-anagen transition to start a new cycle of hair growth (Alonso and Fuchs, 2006). Stem cells are involved in hair follicle renewal within or near the hair bulb matrix. Slow-cycling stem cells have also been found in the follicular bulge arising off of the outer root sheath at the site of the arrector pili muscle attachment. The period of each phase of growth differs from hair to hair on any one individual (Ibrahimi et al., 2011) and as such, each strand of hair on the human body is at its own stage of development, however the anagen phase constitutes about 90% of the growth cycle.

### 2.1.3 Hair types

There are three main types of hair, namely lanugo, vellus and terminal hair. Lanugo hairs are fine, soft, unmedullated and non-pigmented that covers a fetus. Lanugo hair usually sheds after the sixth month of gestation. Lanugo hairs possess a smooth surface with almost indiscriminate scales. It is replaced by vellus and terminal hairs (Goldberg et al., 2005).

Vellus hairs frequently referred to as “peach fuzz,” are non-pigmented to slightly pigmented unmedullated hairs found on the arms and legs. Vellus hairs aid in body
temperature regulation. They have a diameter of roughly 30 µm and rarely are more than 20 mm in length (Goldberg et al., 2005). Terminal hairs are long, dark and thick, compared to vellus hair. Their shafts range from 150 to 300 µm in diameter and are found on the eyebrows, eyelashes, and scalp, and to a lesser extent, the limbs of both genders. The type of hair produced is capable of changing (e.g., vellus to terminal hair at puberty, or terminal to vellus hair in androgenic alopecia) (Ibrahimi et al., 2011).

2.1.4 Hair colour
Hair colour is determined by the quantity and form of pigment in the hair shaft. Melanocytes are star-shaped cells that produce small grains of coloured pigment called melanin. Melanocytes are found in the upper portion of the hair bulb and outer root sheath (Solano, 2014). By lengthening their dendrites (arm like structures) they insert the pigment into the keratinocytes of the hair shaft when it is being formed. Melanocytes produce two forms of melanin in the hair and skin, i.e. eumelanin which is a brown-black pigment, and pheomelanin which is a red pigment. These pigments blend together to give the various shades of colour. The ratio of these two pigments determines the final colour of the hair.

2.2 Classification of Excess Hair
Unwanted, excessive body hair ranges in severity, depending on cultural norms. Excess hair is categorised as either hypertrichosis or hirsutism. Hirsutism is defined as the abnormal growth of terminal hair in women that grows on male-pattern (androgen-dependent) body sites, e.g. the face and chest (Rosenfield, 2005). Hirsutism negatively affects psychological well-being, with resulting social uncertainties, anxiety and psychotic symptoms (Ekbäck, 2017). The causes of hirsutism can be divided into androgenic factors, non-androgenic factors and idiopathic. Non-androgenic factors are comparatively rare, whereas androgenic factors account for more than 80% of cases. This includes polycystic ovary syndrome (PCOS), which affects about 70-80% of hirsute women (Hohl et al., 2014). This abnormal hair growth may be activated by the excess production of androgens. In these cases, androgens cause the alteration of vellus hairs into terminal hairs. Hirsutism in women in a male pattern distribution is an international issue, and
approximately 5-15% of the general female population is reported to be hirsute (Ekbäck, 2017).

Hypertrichosis refers to the growth of excess hair at any site of the body that is not dependent on androgen (Rosenfield, 2005). Hypertrichosis can occur as a result from the drug use, genetic factors, or metabolic and other non-endocrine disorders (Bode et al., 2012). In these instances, hypertrichosis can be treated within weeks to months after terminating the medications (Vulink and Huinink, 2007).

2.3 Laser Hair Removal

The unwanted growth of hair on certain parts of the body is an everyday concern for many women, and even some men with the increased preference for a “neat image” (Jo et al., 2015). The occurrence of excessive facial hair in women can be a cause of significant emotional distress and could have an adverse impact on their quality of life; therefore various methods for hair removal have been pursued (Thacker and Kumar, 2016). Feelings of self-consciousness often result from what is deemed and believed to be the “ideal hair pattern” within our culture and society. For example, in the United States, “ideal” is considered to be no terminal hair except for the scalp, eyebrow, eyelashes and pubis (Loriaux, 2012). For many years, unwanted body hair has been removed utilising temporary methods such as waxing, tweezing, shaving, chemical depilatories and threading. Although these methods are economical and convenient, the results are temporary and require regular upkeep (Thacker and Kumar, 2016). Permanent hair removal can be achieved through electrolysis (the use of electricity to damage the hair follicle). This method can be painful and time consuming, and often leads to pigmentary disorders and scarring with poor application (Thacker and Kumar, 2016).

With the innovation of technology and the development of laser and Intense Pulse Light (IPL) devices for hair removal, it is now possible for unwanted hairs to be permanently reduced. The ability of lasers to non-specifically damage hair follicles was noted approximately 50 years ago in the first reports documenting the use of lasers on human skin. Goldman et al., discovered in 1963 that a ruby laser causes damage to pigmented hair follicles. In 1983, Ohshiro and Maruyama noted hair loss from nevi (moles) following treatment with a ruby laser. It was only later on when the theory of selective photothermolysis was suggested by Anderson and Parrish at the
Wellman Centre for Photomedicine at Harvard Medical School, that the concept of selectively targeting a specific chromophore (photopigments that absorb light) based on its absorption spectra and size was realised (Anderson and Parrish, 1983). Several years later, this group also reported the first successful use of a normal-mode ruby laser for hair removal (Dierickx et al., 1998). In 1998 the first laser targeting melanin was approved by the Food and Drug Administration (FDA).

The discovery of selective photothermolysis and the application of this concept for efficient and lasting laser hair removal, otherwise known as photoepilation, have provided the cosmetic industry and medical practitioner with several highly effective laser and IPL devices (Paasch et al., 2017). Currently, photoepilation is the most demanded therapy by clients in comparison to microdermabrasion and other non-invasive therapies performed by skincare professionals (American Society of Plastic Surgeons, 2017). According to the American Society of Plastic Surgeons, over 1.3 million laser hair removal treatments were performed in 2008. A 48% increase in the number of procedures was seen between the years 2000 - 2017. Laser hair removal was listed forth in the category Cosmetic Minimally-Invasive Procedure performed in 2017 (American Society of Plastic Surgeons, 2017). The enormous public interest and the patient’s demand for laser treatments have led to many physicians following the booming trend, and acquiring a laser device (Loriaux, 2012). The diverse range of devices and applications requires a thorough understanding and knowledge to provide patients and clients with a safe and effective treatment approach, and to manage possible complications (Paasch et al., 2017). Lack in, or the complete absence of experience and training are critical factors that frequently result in professional errors. To ensure thorough training, or making such training possible, established training centres for laser treatments in qualified, certified offices or clinics should be available (Greve and Raulin, 2002).

The word LASER is an acronym for Light Amplification by Stimulated Emission of Radiation. Light energy is absorbed by specific chromophores (targets) in the skin such as melanin, haemoglobin, water, tattoo ink and collagen. In the case of laser hair removal, the chromophore is melanin, i.e. the pigment found in hair. During laser hair removal, a high-intensity pulsed laser beam is directed at the skin. The emitted light is primarily absorbed by the hair shaft melanin. The light energy converts to
intense heat energy which destroys the hair follicle and its bulb. This heat then
diffuses into the surrounding follicular epithelium. A similar principle applies to laser
treatment of vascular lesions, where the heat produced after haemoglobin absorption
is transferred from the blood to the vascular endothelial cells (Ibrahim et al., 2011).

Selective photothermolysis enables one to selectively target pigmented hair follicles
using the melanin in the hair shaft as the chromophore, whilst sparing the
surrounding tissues from damage (Ibrahim et al., 2011), (Figure 2.4). To achieve this,
the wavelength used should be highly absorbable by the target structure, whereby
sufficient amounts of high energy is delivered to inflict thermal damage to the target.
The time of tissue exposure to the laser should be short enough to damage the
target without heat dispersion to the surrounding tissues. This is known as the
thermal relaxation time (TRT) (Stratigos and Dover, 2000). The maximum selective
thermal damage occurs when the pulse duration (the amount of time the laser
energy is applied to the target) is shorter than the TRT of the chromophore. The
chromophore cannot disperse its heat and thermal damage is confined to the target,
thus sparing the surrounding tissue from thermal damage. If the pulse duration is
longer than the TRT, heat dissipates from the chromophore thus injuring the
surrounding tissue (Stratigos and Dover, 2000). The mechanism of action of laser
hair removal is manifested in the immediate histologic alterations in the skin, as well
as its influence on hair growth cycle. Microscopically, treated follicles demonstrate an
instant change in keratinocyte swelling, scattered necrotic and apoptotic
keratinocytes, and full-thickness necrosis of the follicles, depending on the amount of
energy absorbed (Gan and Graber, 2013).

In the case of laser hair removal, the laser energy acts specifically to destroy the
target (melanin). Epidermal (superficial layer of the skin) melanin competitively
absorbs the same wavelengths used for hair removal, as the wavelength or light
cannot distinguish between the melanin in the skin and the melanin in the hair. In
darker skinned individuals, the greater content of melanin in the epidermis competes
with hair follicles for the absorption of light, increasing the risk of thermal burns,
blisters and hyperpigmentation (Alster and Nanni, 2001). Melanin functions as a
chromophore for wavelengths in the red and near infrared (NIR) fraction of the
electromagnetic spectrum (Anderson and Parrish, 1981). However, in order to
accomplish permanent hair removal, the biological “target” is likely the follicular stem cells found in the bulge region and/or dermal papilla. The anagen growth phase is ideal for light based therapies that include laser hair removal, as the hair is still attached to the papilla. The heat generated by the laser can destroy the papilla and prevent any new growth. Multiple treatments are necessary to get a significant (i.e. 80%) reduction. In addition to this, hairs become less pigmented and less coarse in texture (Sachdeva, 2010). Temporary laser hair removal can result when the follicular stem cells are not completely destroyed. This may be due to the hairs being in the catagen growth phase inside a pigmented hair follicle, or they are in the telogen growth phase. Long-term hair removal depends on hair colour, skin colour, tolerated fluence and the phase of the hair growth. Roughly, a 20% long-term hair reduction may be observed with each treatment when optimal treatment parameters are used (Grossman, 2000).

![Figure 2.4 Laser hair removal (Luxe laser, n.d.).](image)

Some factors which are key to the success of laser hair removal treatments include correct patient selection, pre-operative preparation, informed consent, understanding of the principles of laser safety, and laser and light source selection. Knowledge on hair anatomy, growth and physiology, together with a thorough understanding of laser tissue interaction within the context of choosing optimal laser parameters for
effective laser hair reduction, should be acquired before using lasers for hair removal (Ibrahimi et al., 2011).

2.3.1 Laser tissue interaction

A laser beam that encounters a skin surface may either be reflected, transmitted, scattered or absorbed. Only absorbed photons (packets of light) can produce tissue effects. This absorbed light gives the desired effect of hair removal. For photon absorption to occur within tissue, a chromophore is necessary. Therefore, in the case of laser hair removal, the aim is to increase the photon absorption by reducing its reflection, scattering and transmission (Ibrahimi et al., 2011). If no chromophores are present, then all the photons will be transmitted through the tissue without producing any effect. This is described as total transmission. A chromophore is necessary for all light based therapies when a specific target must be destroyed or damaged, or stimulated as in the case of photobiomodulation (PBM) that is more commonly known as low-level laser therapy (LLLT). Reflection occurs at all media interfaces through which the laser beam is moving, such as air, water, jelly, optical glass, a sapphire tip, and skin surfaces. For example, the stratum corneum reflects approximately 4% to 7% of visible light that encounters the skin surface (Ibrahimi et al., 2011). Scattering occurs when there is a lack of homogeneity in the skin’s structures such as molecules, organelles, cells and larger tissue structures. In the dermis, scattering has shown to occur mainly in homogeneitous structures whose size is similar to the wavelength or slightly larger, e.g. collagen fibres. Greater scattering will result in a shorter penetration depth, and could result in less absorption (Anderson and Parrish, 1981).

Lasers used in hair removal require optimal parameters of wavelength, pulse duration and fluence to reduce heating and injury to the desired chromophore without dissipation to surrounding tissues (Ibrahimi et al., 2011). The energy refers to the amount of delivered photons and is measured in joules (J). Power refers to the delivery rate of energy (1 W = 1 J) and is measured in watts (W). Fluence is the total energy delivered per unit area and is measured in J/cm². Pulse duration is the amount of time the laser energy is applied, which is usually measured in milliseconds (ms). The pulse frequency is measured in hertz (1 Hz = 1 pulse per second); this refers to the repetition rate of the pulses. Wavelength is measured in nanometres.
(nm) and refers to the distance between the peaks of the light waves (Adrian and Shay, 2000). Spot size of the laser refers to the radius of the beam itself. The irradiance of the beam decreases gradually at the edges.

Light at wavelengths between 700 and 1,000 nm are selectively absorbed by melanin, whereas competing chromophores (oxyhemoglobin and water) absorb less energy at these wavelengths. As a result, any light source that operates between 700 and 1,000 nm is suitable for targeting melanin in the hair shaft (Gan and Graber, 2013). Figure 2.5 shows the absorption spectrum of different chromophores in the skin. Hair removal devices available today include 694 nm ruby lasers, 755 nm alexandrite lasers, 810 nm diode lasers, 1,064 nm neodymium-doped yttrium aluminium garnet (Nd:YAG) lasers, and IPL.

![Absorption Spectrum](image)

**Figure 2.5** The absorption of various chromophores as a function of wavelength. Ruby lasers operate at 694 nm, alexandrite lasers at 755 nm, diode lasers at 800 nm and Nd:YAG lasers at 1,064 nm (Boulnois, 1986).
2.3.2 Laser hair removal devices

The Fitzpatrick scale also known as the Fitzpatrick skin-typing test was developed by Thomas Fitzpatrick in 1975. This numerical classification scheme determines the human skin colour in response to ultraviolet light. The scale ranges from skin type I (pale/light skin colour) to skin type VI (darkest skin colour) (Fitzpatrick, 1975). Some of the main laser hair removal devices and their recommended Fitzpatrick skin types are tabulated below (Table 2.2).

Table 2.2 Distinguishing types of light based treatments and recommended Fitzpatrick skin types.

<table>
<thead>
<tr>
<th>Laser type</th>
<th>Wavelength</th>
<th>Skin type</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruby laser</td>
<td>694 nm</td>
<td>Suitable for fair skin types, namely Fitzpatrick I to III. Not suited for darker skin types due to the epidermal melanin interference.</td>
<td>(Lepselter and Elman, 2004)</td>
</tr>
<tr>
<td>Alexandrite laser</td>
<td>755 nm</td>
<td>Suitable for fair skin types, namely Fitzpatrick I to III. Not suited for darker skin types due to the epidermal melanin interference.</td>
<td>(Gan and Graber, 2013)</td>
</tr>
<tr>
<td>Diode laser</td>
<td>810 nm</td>
<td>Suitable for Fitzpatrick skin types I to V.</td>
<td>(Courtney and Goldberg, 2016)</td>
</tr>
<tr>
<td>Nd:YAG laser</td>
<td>1,064 nm</td>
<td>Suitable for Fitzpatrick skin types I to VI.</td>
<td>(Tanzi and Alster, 2004)</td>
</tr>
<tr>
<td>Intense Pulse Light device (IPL)</td>
<td>400 – 1,400 nm</td>
<td>Typically Fitzpatrick skin type I, and II, depending on device.</td>
<td>(Gan and Graber, 2013)</td>
</tr>
</tbody>
</table>

2.3.2.1 Ruby lasers

A study conducted by Campos et al., (2000) showed a reduction in hair growth in 63% (51) of patients however, pigmentary changes occurred most frequently in patients with Fitzpatrick skin type IV. Due to the high melanin absorption at 694 nm, ruby lasers are best suited for individuals with Fitzpatrick skin types I to III and dark hairs. Because of this limitation and its high power consumption, ruby lasers have become less popular for laser hair removal over the years.

2.3.2.2 Alexandrite lasers

Long-term efficiency for long-pulsed alexandrite lasers ranges from 65 to 80.6% (Eremia et al, 2001). Up to six months hair removal can be achieved using an
alexandrite laser with pulse durations of 5, 10 and 20 ms (Nanni and Alster, 1999). Bouzari and colleagues (2004) did not find any significant differences in effectiveness between diode lasers (810 nm) the alexandrite laser and when treating patients with Fitzpatrick skin types I to V. Treating patients with Fitzpatrick skin types I to IV sequentially with a diode laser followed by an alexandrite laser, did not result in greater mean hair reduction than an equal amount of treatments with the alexandrite laser alone. The alexandrite laser has been associated with more side-effects of erythema, folliculitis and blistering (Nilforouschzadeh et al., 2011). Due to its shorter pulse durations, the alexandrite laser may be better suited for treating fine vellus hairs than a diode laser. In summary, alexandrite lasers effectively remove hair with results comparable to diode lasers. It has been suggested that alexandrite lasers be used on Fitzpatrick skin types I to III because of the scarcity of competing epidermal melanin, and low risk of burns and laser-induced dyspigmentation (Gan and Graber, 2013).

2.3.2.3 Diode lasers
Histologic analysis of skin treated with a diode laser shows a statistically significant reduction in hair thickness and density (Ilknur et al., 2010). It was reported that the reduction in hair count with a long pulse 810 nm diode laser varies from 22% to 59% (Lou et al., 2000). Diode lasers with longer wavelengths, and 1,064 nm Nd:YAG lasers, are favoured over lasers with shorter wavelengths when treating darker skin types as fewer side effects occur, such as post-inflammatory hyperpigmentation, and is due to less epidermal melanin absorption. Effectiveness of hair removal between a diode laser (810 nm) and a Nd:YAG laser (1,064 nm) is inconsistent amongst studies. Li and colleagues (2010) showed that a diode laser produced greater hair removal (78.6%) than a long-pulse Nd:YAG laser (64.5%), whereas Chan and colleagues (2001) did not find any difference. Another study found that the use of a Nd:YAG laser was more painful than a diode laser (810 nm) when treating Asian skin, and was due to the higher fluence that is needed when performing laser hair removal with a Nd:YAG laser (Wanitphakdeedecha et al., 2012). A number of studies have found few and temporary side effects using diode lasers to treat patients with Fitzpatrick skin types III to V. The most common side effects were slight, and included pigmentedary changes and transient erythema.
2.3.2.4 Nd:YAG lasers

It has been reported that individuals with darker skin types necessitate higher fluences for effective hair removal because epidermal melanin interacts with and absorbs some of the photon energy (Handattu and Pai, 2016). However, a higher fluence did not linearly correlate with greater hair loss. In the study by Handattu and Pai (2016) and in general, lighter-skinned individuals have less competing epidermal melanin. At any given fluence, a greater fraction of photon energy is able to penetrate the bulge stem cells. Therefore, in such individuals, a higher fluence results in a more linear correlation with the extent of hair loss. In the Rogachefsky et al. (2002) study, adverse side effects such as erythema, peri-follicular oedema and pain were associated with higher fluences. The Nd:YAG laser has a longer wavelength which serves as a protective factor against epidermal melanin thermal damage in darker skin tones, and allows for the use of higher fluences to provide improved clinical results (Fayne et al., 2017).

An IPL device and the Nd:YAG laser were compared in a study treating axillary hair in 39 women with Fitzpatrick skin types IV to VI. At a 6-month follow-up, there was a statistically significant reduction in hair counts in women treated with the Nd:YAG laser (79.4%) than on the IPL side (54.4%) (Ismail, 2012). Not only did the Nd:YAG laser produce a greater reduction in hair, but also a higher level of patient satisfaction. Because there is less risk of epidermal melanin absorption, it was recommended to make use of the Nd:YAG laser on individuals with Fitzpatrick skin types IV to VI. Fayne et al., (2017) reviewed the literature for studies on laser hair removal in Fitzpatrick skin types IV to VI and making use of Nd:YAG lasers. Based on their findings, safe and effective hair removal in these patients is attainable under proper treatment protocols and energy settings.

2.3.2.5 Intense Pulsed Light (IPL)

Although IPL devices are non-laser devices, they are still used for permanent reduction in hair removal. IPL technology is also based on the principle of selective photothermolysis. IPL devices emit polychromatic (i.e. more than one wavelength of light which targets more than one chromophore in the skin), non-coherent (i.e. the photons are not in the same phase) and non-collimated (i.e. the beam does not run parallel and divert in the skin) light, illustrated in Figure 2.6. The wavelengths range
from 400 to 1,400 nm. Different filters are used to target different chromophores (Zandi and Lui, 2013). Depending on the type of cut-off filters used, an IPL device can emit a defined range of wavelengths capable of reaching the desired depth of the target structures. Due to its capacity to emit a range of wavelengths, a single light exposure can excite several chromophores (water, hemoglobin, melanin, collagen and tattoo ink) at once. Thus, in the hands of inexperienced personnel, complications from non-specific thermal damage could easily occur (Gan and Graber, 2013).

However, an advantage of IPL is its lower cost, robustness, versatility and high skin coverage rate due to a larger spot size, which will allow for much quicker treatments for large areas such as the back and chest (Martella and Raichi, 2017). Treatment duration for a given area is shorter than for a smaller spot size (Gan and Graber, 2013). A disadvantage of these devices are the heavy weight of the IPL handpiece, which comprises the lamp and lamp cooling device. In the spectrum of light emitted from an IPL device, low wavelengths can disadvantageously target epidermal melanin, and such devices with a light range that starts in the lower wavelengths are not recommended for darker skin types (Gan and Graber, 2013).

2.4 Hazards Associated with Laser Hair Removal
Lasers are classified from Class 1 through to Class 4, according to the potential harm that the laser beam can cause. Class 4 lasers are typically used for medical and therapeutic treatments such as laser hair removal. These lasers are powerful
devices and can cause skin burns (Figure 2.7 and 2.8) and eyesight damage, or set fire to materials if the equipment is not used correctly. Class 4 lasers must be used with extreme care, and this is why adequate training and protocols are essential.

Figure 2.7 Examples of laser hair removal-induced hyperpigmentation (A, B, C, and D) (Ibrahimi et al., 2011).

Figure 2.8 Permanent hypopigmentation resulting from laser hair removal and IPL devices. (A) Temporary hyperpigmentation in a Fitzpatrick skin phototype IV treated with an IPL device for hair removal. (B) One month later, the hyperpigmented lesions were replaced with persisting hypopigmented lesions. (C) Temporary hyperpigmentation in a Fitzpatrick skin phototype VI patient treated with an Nd:YAG device. (D) Two weeks later, the annular hyperpigmented lesions were replaced with persisting hypopigmented lesions (Ibrahimi et al., 2011).
2.4.1 Patient hazards

The wide range of devices and applications require profound knowledge in order to provide patients with safe and effective treatment strategies, as well as to identify potential drug interactions (Table 2.3), and preventing or managing possible complications associated with laser hair removal (Table 2.4) (Bodendorf et al., 2013).

Table 2.3 Photosensitising drugs (Bodendorf et al., 2013).

<table>
<thead>
<tr>
<th>Photosensitising drugs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diuretics</td>
<td>Hydrochlorothiazide, furosemide, bendroflumethiazide, amiloride, etacrynic acid, triamterene, spironolactone, xipamide</td>
</tr>
<tr>
<td>Non-steroidal anti-inflammatory drugs</td>
<td>Naproxen, ketoprofen, tiaprofenic acid, piroxicam, diclofenac, phenylbutazone, mefenamic acid, indomethacin, ibuprofen</td>
</tr>
<tr>
<td>Antimicrobial agents</td>
<td>Sulfamethoxazole/trimethoprim, sulfasalazine, ciprofloxacin, enoxacin, lomefloxacin, ofloxacin, norfloxacin, oxytetracycline, tetracycline, doxycycline, minocycline, isoniazid, gentamycin, griseofulvin, nitrofurantoin</td>
</tr>
<tr>
<td>Antimalarial agents</td>
<td>Chloroquine, quinine, pyrimethamine, mefloquine, hydroxychloroquine</td>
</tr>
<tr>
<td>Antipsychotic drugs</td>
<td>Chlorpromazine, thioridazine, promethazine, chlorprothixene, perazine, fluphenazine, promazine, haloperidol</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>Amitriptyline, trimipramine, nortriptyline, desipramine, imipramine, doxepin, clomipramine</td>
</tr>
<tr>
<td>Cardiovascular agents</td>
<td>Amiodarone, nifedipine, quinidine, captopril, enalapril, fosinopril, ramipril, disopyramide, hydralazine, simvastatin</td>
</tr>
<tr>
<td>Anti-epileptic drugs</td>
<td>Carbamazepine, lamotrigine, phenobarbital, phenytoin, topiramate, valproic acid</td>
</tr>
<tr>
<td>Antihistamines</td>
<td>Cyproheptadine, diphenhydramine, loratadine</td>
</tr>
<tr>
<td>Cytotoxic agents</td>
<td>Fluorouracil, vinblastine, dacarbazine, procarbazine, methotrexate, azathioprine</td>
</tr>
<tr>
<td>Hormones</td>
<td>Corticosteroids, estrogens, progesterone, spironolactone</td>
</tr>
<tr>
<td>Systemic dermatological agents</td>
<td>Isotretinoin, alitretinoin, tretinoin, methoxsalen (8-methoxypsoralen)</td>
</tr>
<tr>
<td>Others</td>
<td>Gold salts, hematoporphyrin</td>
</tr>
</tbody>
</table>

Other uncommon side effects include rosacea-like rash, induction or aggravation of acne, early greying of hair, tunnelling of hair under the skin (ingrown hairs), persistent erythema and oedema of the face, and inflammatory and pigmentary changes of pre-existing nevi (Rasheed, 2009). Despite the use of metal protective lenses when treating in the area, some reported ocular complications include iritis, cataracts, pupillary distortion, iris atrophy, posterior synechiae, uveitis, photophobia, and visual field (Brilakis and Holland, 2004).
Table 2.4  Published side effects associated with laser epilation (Bodendorf et al., 2013).

<table>
<thead>
<tr>
<th>Immediate reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burns and curling of external hair components</td>
</tr>
<tr>
<td>burned smell, plume</td>
</tr>
<tr>
<td>Diffuse erythema</td>
</tr>
<tr>
<td>Perifollicular erythema</td>
</tr>
<tr>
<td>Perifollicular oedema/wheals</td>
</tr>
<tr>
<td>Treatment-associated pain</td>
</tr>
<tr>
<td>Cold urticarial</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Delayed reactions</td>
</tr>
<tr>
<td>(Diffuse) erythema</td>
</tr>
<tr>
<td>Blistering/erosions</td>
</tr>
<tr>
<td>Purpura</td>
</tr>
<tr>
<td>Crusting</td>
</tr>
<tr>
<td>Hyperpigmentation</td>
</tr>
<tr>
<td>Hypopigmentation</td>
</tr>
<tr>
<td>Folliculitis, acneiform reactions, exacerbation of acne</td>
</tr>
<tr>
<td>Infections</td>
</tr>
<tr>
<td>Scars</td>
</tr>
<tr>
<td>Koebnerization, vitiligo, psoriasis, Lichen planus</td>
</tr>
<tr>
<td>Changes in nevi after photoepilation</td>
</tr>
<tr>
<td>Thrombophlebitis</td>
</tr>
<tr>
<td>No effect, partial or complete hair regrowth</td>
</tr>
<tr>
<td>Angular cheilitis</td>
</tr>
<tr>
<td>Focal depigmentation of the lips</td>
</tr>
<tr>
<td>Allergic reaction to cryospray</td>
</tr>
<tr>
<td>Hyperhidrosis, bromhidrosis after axillary epilation</td>
</tr>
<tr>
<td>Leukotrichia</td>
</tr>
<tr>
<td>Paradoxical hair growth in the treated area or adjacent to it</td>
</tr>
<tr>
<td>Pili bigemini</td>
</tr>
<tr>
<td>Dry skin</td>
</tr>
<tr>
<td>Reactivation of herpes simplex</td>
</tr>
<tr>
<td>Bacterial infection – Livedo reticularis</td>
</tr>
<tr>
<td>Urticarial vasculitis</td>
</tr>
<tr>
<td>Pruritis</td>
</tr>
<tr>
<td>Excoriation</td>
</tr>
<tr>
<td>Terminalization of hairs</td>
</tr>
<tr>
<td>Induction of rosacea</td>
</tr>
<tr>
<td>Textural changes</td>
</tr>
<tr>
<td>Brightening of pigmented lesions</td>
</tr>
</tbody>
</table>

Improper wavelength selection or improper fluencies (energy in an area) are common errors that occur. The Canadian Dermatology Association states that "73 per cent of dermatologists surveyed have treated patients for burns, scars or other wounds sustained after seeking laser treatments" (Sourtzis, 2012). Complications
can be greatly reduced by an understanding of laser physics and treatment regime through effective training of the laser operator.

Currently, most high power laser systems have cooling devices integrated into the system to protect the epidermis, reduce pain and erythema, and to improve the efficacy of the laser treatment (Das et al., 2016). Cooling mechanisms such as forced cold air, contact cooling, or a delayed cooling device makes use of cold air or liquid nitrogen (cryogen spray) to reduce the skin surface temperature and protect the epidermal melanin, preventing unwanted hyperpigmentation or burns. It has an analgesic effect and thus reduces patient discomfort (Fisher et al., 2005). The aim of these devices is to aid in maximal thermal damage to the target chromophores while reducing injury to the surrounding skin (Das et al., 2016). Dark-skinned patients are more susceptible to the side effects of laser hair removal treatment as the increased epidermal melanin competes as a significant chromophore for laser energy (Nelson et al., 2000). Absorption of energy by melanin may lead to the production of excessive heat, but subsequent cooling of the epidermis may prevent the temperature rising beyond the threshold temperature liable for thermal injury. Cooling procedures should be performed before, during or after laser treatment, this is referred to as pre-cooling, parallel cooling and post-cooling (Zenzie et al., 2000).

Contact cooling can be achieved by active (copper and sapphire tips) or passive (ice or cold gels) methods. In passive contact cooling, the device eliminates heat from the surface of the skin by energy transfer (from the warm skin surface to a cold cooling agent). However, in active contact cooling, the heat transposed to the device is actively removed by thermoelectric elements or flowing liquid cooling agents. In non-contact cooling, heat is actively eliminated from tissues via evaporation or convection. Non-contact cooling can be obtained using cryogen spray or cold air. The various techniques are summarised in Table 2.5 below.
Table 2.5  An overview of the methods of cooling during laser therapy (Das et al., 2016).

<table>
<thead>
<tr>
<th>Type</th>
<th>Indications</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact skin cooling (active and passive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active (copper, sapphire tips)</td>
<td>Indicated for anaesthesia in dermatolosurgery. Highly effective in cases where longer pulse durations (≥ 10 milliseconds, ms) are required.</td>
<td>Limiting factors include cost of the handpiece, expensive lasers and cooling agents and the requirements of good technical expertise.</td>
</tr>
<tr>
<td>Passive (ice cube/ice pack)</td>
<td>Indicated for prevention and/or reduction of inflammation following the procedure. Used in the management of port-wine stains, telangiectasia and laser hair removal.</td>
<td>Ice cube/pack cooling is an easy method. Good option for bulk cooling. Disadvantages include a waiting period before the cooling starts, production of bubbles and melting water on the skin, or the melting of the ice pack. Cannot provide prolonged cooling.</td>
</tr>
<tr>
<td>Non – contact skin cooling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cryogen spray (liquid nitrogen)</td>
<td>Used in the past, not recommended now.</td>
<td>Cryonecrosis can be a serious issue.</td>
</tr>
<tr>
<td>Pulse cryogen spray (dynamic cooling device)</td>
<td>Indicated for laser with pulse durations ≤ 5 ms. Useful in laser hair removal and management of birthmarks.</td>
<td>The inbuilt software makes this technique extremely user-friendly. The settings can be adjusted as per requirements. Since it provides uniform cooling, it is currently the method of choice. Not effective with pulse lengths ≥ 10 ms.</td>
</tr>
<tr>
<td>Force refrigerated air</td>
<td>Used for port wine-stains, and hair and tattoo removal.</td>
<td>This method is compatible with laser devices. The comfort level for the doctor and the patient is high. However, post inflammatory hyperpigmentation has been reported.</td>
</tr>
</tbody>
</table>

The Radiation Health Committee (RHC) Working Group in Australia conducted a voluntary, anonymous survey on accidents/incidents caused by the use of lasers and IPL devices in registered health practitioners and non-medical practitioners. They considered the use of laser and IPL devices for cosmetic purposes, i.e. laser hair removal, from 15 November 2012 to 13 December 2012 (The 2012 Survey) in Australia (Consultation Regulatory Impact Statement, 2015). The survey drew 430 responses from five medical practitioner groups (38%) and six other health and beauty practitioner groups (62%). Responses by medical practitioners showed that because a pigmented lesion was incorrectly treated with a laser or IPL device, 62
cases of missed or delayed diagnoses of skin cancer occurred in a 12 month period. Of these 62 cases, 22 cases of diagnosis of a melanoma was delayed or completely missed. Early detection of melanoma is crucial since it is the most dangerous form of skin cancer with the highest mortality rate. Instead of being cut out and removed, these malignant lesions were treated with a laser device, which represents a significant health risk with devastating outcomes for the patients (Consultation Regulatory Impact Statement, 2015).

The responses to the 2012 Survey also showed a total of 416 injuries in the preceding 12 months, of which 268 were described as severe injuries such as burns/blistering, permanent pigmentary changes and scarring. The 2012 Survey also provided information on the cause of the injuries. Respondents reported that more than 50% of the 268 injured were training-related. Proper training and a registered qualification is very important to understand the risks and effects of IPL and lasers on various skin types, and the condition being treated to ensure proper treatment management (Consultation Regulatory Impact Statement, 2015). The risk of injury to the eyes leading to permanent retinal damage is not insignificant, as IPL and laser devices are progressively being used on facial areas, close to the eyes. The 2012 Survey reported one case of eye injury.

A nationwide retrospective survey from October 2009 to January 2010 was conducted in Germany to obtain data on injuries and their possible causes following laser and IPL hair removal treatments. Fifty patients (of which data from 7 had to be excluded due to uncertain, missing, or unspecific data) participated and reported treatment errors arising from IPL and laser treatments by laypersons. Of the laypersons administering treatment, 2.3% were tattoo artists, 13.9% were trained assistants, 32.6% had unidentified qualifications, and 51.2% were cosmetologists. The following equipment was used for treatment: 62.8% were treated with an IPL devise, 18.6% were treated with a laser, and in 18.6% the modality was uncertain. The following complications ensued: textural changes (14%), scarring (25.6%), and pigmentary changes (81.4%). Inadequate information without physical injury, e.g., non-clearance after laser epilation, occurred in 4.6% of cases (hair was too thin or light and would not have been treatable by the methods used). The following treatment errors occurred: excessive energy application in 62.8% of patients; wrong
technology for the indication in 39.5%, e.g. selection of improper treatment device, inadequate cooling on the skin in 7% of patients and inadequate information in 4.6% of patients (Hammes et al., 2013).

In the United States, 88 patients were reportedly injured by laser hair removal devices between the period of 01 January 2009 to 31 December 2011 (Food and Drug Administration, 2011). A total of 14 reports were filed in which 20 patients were reported as injured in 2011. A total of 25 reports were filed in which 31 patients were reported as injured in 2010. A total of 22 reports were filed in which 37 patients were reported as injured in 2009. Out of the 88 patients, three of the reported injuries have been removed from the statistics as one involved a laser purchased for home use, one was determined to have a psychiatric origin with no actual injury, and one patient was reported injured in a non-hair removal procedure. Reducing the total injured in the report to 85 patients. Of the 85 injuries, eight were determined to be the result of inadequate conduct of a patch test on the patient; seven were determined to be the result of overtreatment; eight were determined to be the result of operator error in selecting correct settings or exercising poor technique with the hand device; 26 were determined to be the result of poor equipment maintenance (of which the vast majority failed to keep the treatment tip on the hand tool clean); two were due to treating patients who had recently achieved tans; one was due to failure to calibrate the device correctly; one was due to failure to shave the area being treated prior to treatment; one was due to treatment of a patient who had been taking medication for a year previously that caused hyper-photosensitivity; and in 31 of the cases reported, the cause of the injuries could not be determined. Of the 85 patients affected, 58 were reported as having burns (four having third-degree burns, and 54 having first or second degree burns), nine reported scarring, seven reported blisters, two reported redness or inflammation, six reported hypopigmentation, two reported swelling, and one reported an “adverse reaction” which was not specified (Food and Drug Administration, 2011).

Sperber et al., (2005) reported on a 21-year-old woman who experienced a severe blistering eruption, while Shin and colleagues (2010) exposed a case of a 41-year-old woman who developed vitiligo on the cheek and the mandibular area following an IPL hair removal treatment. Parver et al., (2012) has reported ocular injury such as
anterior uveitis, corneal burns, uveitis, cataract formation, and retinal burns. Fodor and colleagues (2005) reported one case of hypopigmentation and one case of leukotrichia (whiteness in the hair). According to Jalian et al., (2013), from 1985 to 2012 the authors identified 174 cases associated with injury caused by cutaneous laser treatments. The incidence of litigation related to laser treatments showed an increasing trend, with peak occurrence in 2010. Laser hair removal was the most common litigated procedure. Laser hair removal resulting in litigation was at 36.2%, followed by rejuvenation laser treatments (24.7%) and vascular laser treatments (8%). Lawsuits associated with injuries from 1999 to 2012 involving non-physicians increased from 36.3% in 2008 to 77.8% in 2011. Laser hair removal was the most commonly performed laser procedure in these lawsuits (Happel, 2016).

2.4.2 Occupational hazards
Other associated hazards include occupational exposure to the laser plume which are the vapours, smoke, and particulate debris that is produced during a laser hair removal treatment. The laser plume is known to be carcinogenic (cancer causing) and a teratogen (an agent that may disturb the development of an embryo or foetus). To date, little is known regarding exposure to the laser hair removal plume, although the surgical plume generated from electro cautery devices is a known occupational hazard for operators (American National Standards Institute, 2007; Lewin et al., 2011). A study conducted by Chuang et al (2016), indicated that burning-hair plume during a laser hair removal treatment should be considered a biohazard. Discarded terminal hairs from two adult volunteers were tested. These hairs was sealed in glass gas chromatography chamber and treated with a laser. The laser plume was analysed and 377 chemical compounds were identified, of which 13 are known or suspected carcinogens and more than 20 are known environmental toxins. In the same study, they also tested ultrafine particles (UFP) during laser hair removal treatment using a portable condensation particle counter (CPC) in the treatment room and in the waiting room at baseline during, and after the treatment. According to the results, there was an increase in UFPs, with between 69 976 and 129 376 particles per cubic centimetre at the level of the laser operator. Another study conducted by Eshleman and colleagues (2017), which included a total of 17 laser hair removal procedures sampled over four days. Four procedures were excluded for failing quality control checks and an additional procedure was excluded due to
the instrument battery failing before the procedure was completed. After these exclusions, 12 procedures were available for analyses. UFP concentration in the procedure rooms was greater than the levels in the waiting room. UFP levels increased rapidly in the procedure room during treatment, peaked at the end of the procedure, and decreased after procedures. UFP levels were directly related to the duration of the procedures. Chronic exposure to ambient particulate matter has been linked to serious health effects, which includes lung cancer, increased systemic inflammation, oxidative stress and other cardiopulmonary diseases. Acute exposure to ambient UFP has been associated with decreased lung function, decreased heart rate variability, increased inflammation and coagulation in the lungs and peripheral blood, and risk of myocardial infarctions (Edwards and Reiman, 2008; Rich et al., 2012).

2.5 Regulation of Laser Hair Removal Operators

Laser hair removal and the use of these high powered devices are risky and can cause severe complications. Therefore, sufficient regulations are needed to limit complications.

2.5.1 United Kingdom training requirements and regulations

Until October 2010, the CQC used to regulate both healthcare professional and non-healthcare professional operators using lasers and intense light sources (which include IPL and light emitting diodes (LED) in facilities providing either treatment of disease, disorder or injury or non-surgical cosmetic interventions, or both. The Care Standards Act 2000 included standards for varies providers. The standard included ‘Prescribed Techniques and Prescribed Technologies’ (‘P’ standard) for laser and intense light source (ILS) treatments. The British Medical Laser Association (BMLA) re-launched and updated the IHAS Essential Standard in 2015/2016. The ‘P’ standards form the basis for the IHAS Essential Standards. In 2010, the UK government deregulated the non-surgical cosmetic intervention sector in England, with the repeal of the Care Standards Act 2000 and only healthcare professional are required to register with the CQC. As a result of the repeal of the Care Standards Act 2000, anyone in England can legally purchase a laser and ILS device with little to no training. There are also few restrictions for enforcing appropriate insurance or working from suitable premises (Town and Brown, 2017). The provisions of ‘P’
standards still apply in Wales and Northern Ireland. The standards are enforced by the Regulation and Quality Improvement Authority (RQIA) and by the Health Inspectorate Wales (HIW) (Nidirect government services, n.d.; Healthcare Inspectorate Wales, 2017). In certain areas in England, a licensing scheme exists for establishments that provide laser and ILS treatments. These areas include London boroughs, Nottingham, Birmingham and some Essex boroughs. In Scotland, the Healthcare Improvement Scotland (HIS) regulates independent hospitals, voluntary hospices and private psychiatric hospitals. However, since April 2016, HIS formally registers independent clinics in Scotland where services are provided by registered nurses, midwives, medical practitioners and dental care professionals’ dental practitioners. HIS does not regulate non-medical professionals (Town and Brown, 2017).

2.5.2 United States training requirements and regulations
In the United States of America, Arizona was the first state that required a specific number of mandatory training hours in order to legally perform light based treatments for hair removal. An aesthetician or a cosmetologist who wishes to perform cosmetic laser procedures and procedures using IPL devices must adhere to the following:

- Apply for and receive a certificate from the Arizona Radiation Regulatory Agency.
- Successfully complete 40 hours of didactic training.
- The program should provide a provisional certificate to the candidate validating the successful completion of the didactic training.
- For hair removal, candidates are required to complete practical training that is supervised by a health professional or by a laser technician who has a minimum of 100 hours of practical experience per procedure. There should be 24 hours of practical supervision of laser and IPL devices used. The supervising health professional or laser technician must confirm that the aesthetician or cosmetologist has completed the training under supervision.
- For other cosmetic laser and IPL device procedures, individuals are to complete a minimum of an additional 24 hours of practical training of at least ten cosmetic procedures for each type of specific procedure under supervision (Arizona Revised Statutes, 2014).
In other states, such as Texas, the new regulations fall under The Texas Department of Health. These are the levels for Laser Technicians certification:

A. Certified Laser Hair Removal Professional
B. Senior Laser Hair Removal Technician
C. Laser Hair Removal Apprentice-In-Training
D. Laser Hair Removal Technician

A. Certified Laser Hair Removal Professional
A candidate for a laser hair removal professional certificate must:

- Be certified by a recognised certifying agency, including the Society for Clinical and Medical Hair Removal, or another certification entity approved by the department.
- Achieve the requirements for a senior laser hair removal technician certificate.
- Pass an examination required by the department.

A laser hair removal professional that is certified and acting under the protocol established with a consulting physician may perform laser hair removal without supervision.

B. Senior Laser Hair Removal Technician
A candidate for a senior laser hair removal technician certificate must:

- Achieve the requirements for a laser hair removal technician certificate.
- Must have supervised at least 100 laser hair removal procedures, as audited by a certified laser hair removal professional.

The qualifications eligible for an applicant for a senior laser hair removal technician certificate, who is a licensed health professional, shall be established by the entity that issues licenses for that health profession.

C. Laser Hair Removal Apprentice-In-Training
A candidate for a laser hair removal apprentice-in-training certificate must:
• Have at least 24 hours of training in safety, laser physics, skin typing, skin reactions, treatment protocols, burns, eye protection, emergencies, and post treatment protocols.

• A laser hair removal apprentice-in-training must perform directly under the supervision of a senior laser hair removal technician or a certified laser hair removal professional.

D. Laser Hair Removal Technician:
A candidate for a laser hair removal technician certificate must:

• Achieve the requirements for a laser hair removal apprentice-in-training certificate.

• Have performed at least 100 laser hair removal procedures under the direct supervision of a senior laser hair removal technician or a certified laser hair removal professional (Texas Department of Licensing and Regulation, 2017).

In the State of Florida the following is required:

• Completion of a 30 hour continuing education course approved by the Electrolysis council.

• A minimum of five hours practical experience in laser and light based devices (Silberman, 2012).

• Candidates must pass the Society for Clinical and Medical Hair Removal test for certification as a Certified Medical Electrologist.

• Certification by a National certification organisation approved by the Electrolysis Council and the Board of Medicine, which is the Society of Clinical & Medical Hair Removal.

• Once certified, the electrologist may only use the laser and light-based hair removal devices upon which they have been trained.

• The electrologist must operate under the direct supervision and responsibility of a physician properly trained in laser hair removal (Florida Department of Health, 2014).

The supervisor and the electrologist requires the development of written protocols regarding the medical condition for individuals to receive laser and light-based hair
removal treatment; detailed conditions and the procedure for identifying conditions that require direct evaluation or specific consultation by the physician; routine treatment to address minor complications resulting during or from laser and light-based hair removal treatment; and detailed procedures to be followed in the event of emergencies that may develop during the performance of or as a result of laser and light-based hair removal treatment. These written protocols must be signed, dated, and maintained and kept readily available on the premises where the electrologist practices. A copy shall be kept by the supervisor and another copy must be filed with the Department of Health. The written protocols should be kept on the premises and should be readily available for inspection and review by agents of the Department of Health (Florida Department of Health, 2014).

2.5.3 Australia training requirements and regulations

It is a requirement that laser and IPL operators in Tasmania, Australia obtain a certificate of compliance in order to perform light based procedures. Since there are no national aligned training programmes for cosmetic lasers and IPLs, applications are considered on a case-by-case bases. Licenced operators must show a level of competency when using these high tech devices, as well as demonstrate suitable understanding and knowledge in laser and IPL safety. Registered medical practitioners who have a sufficient amount of skills and training are expected to supervise laser and IPL operators in the use of these devices for which they were authorised as per the licence (Consultation Regulatory Impact Statement, 2015).

When using a Class 4 laser for cosmetic or/and medical purposes in Queensland, Australia, candidates are required to apply for a licence. In addition to obtaining a licence, operators of laser devices must provide evidence of competency in the use of lasers. Operators acquiring a certificate to operate laser devices needs proof that they have comprehensive knowledge and an understanding in operating a laser, as well as safe practice of using a laser device. A copy of the training certificates or official credentials must be made available on request. The use of these devices should be done under direct supervision of a medical practitioner (Consultation Regulatory Impact Statement, 2015).
To perform laser hair removal in Western Australia, operators must be licenced and the individuals operating a Class 3B or/and Class 4 laser device must obtain the appropriate qualification. The licensee may then perform laser hair removal; however this should be done under direct supervision of a medical practitioner (Consultation Regulatory Impact Statement, 2015).

2.5.4 South Africa
In South Africa, one of the concerns regarding laser therapy is who can perform these procedures and what qualifications and training are required to enable individuals to perform them. Unfortunately, there is currently no legislation regarding the supply and purchase of laser devices. In other words, anyone with a sufficient amount of money can purchase a laser device, even with poor or no qualifications or experience. Most suppliers may offer non-accredited or informal training of two to four days. If the suppliers were offering accredited training, the duration of the course should be at least 100 hours (practical and theory) according to the SAAHSP (Crichton, 2012). SAAHSP is a non-profit organisation the somatology, beauty, spa and wellness industry and profession; however, SAAHSP does not have statutory power to enforce their minimum standard i.e. 100 hours within the industry (South African Association of Health and Skincare Professionals, n.d.).

2.6 Conclusion
In South Africa, the lack of any form of regulation and qualification regarding cosmetic laser and IPL treatments, including hair removal, is problematic. The increased growth in the Health Skin Care industry offering laser hair removal, without any educational requirements, poses a serious risk to the public. The public will not know whether the laser hair removal operator is qualified or not. It becomes ‘buyer’s awareness’ for the public which could place the public at unwittingly risk, since these types treatments are offered not just at ‘medical spas’ but also at day salons, hotel/resorts and even people’s residences.

Lack of regulation also leads to individuals creating their own job titles such as “medical aesthetician”, yet these are not recognised credentials. No specific accreditation is required for aestheticians to work in medical spas or laser clinics in South Africa. Training to perform treatments such as laser and IPL hair removal is of
high risk due to a lack of consistency in training. On one hand, courses in the field of medical aesthetics are being added to existing academic programs offered at public and private training facilities, or as post-graduate studies after completing a Health and Skincare certification or Somatology National Diploma from a registered training provider. On the other hand, informal courses and on-site training in the field of medical aesthetics could be one or more days, offered by the supplier selling the device, spa owners/managers, or senior laser hair removal operators. As the growth of the Health and Skincare industry continues, inconsistent educational requirements and lack of regulation will likely increase the risk of potential harm therefore necessary steps and procedures needs to be taken to protect the public. Currently the only recourse the public has is to report damages through the Consumer Protection Act route.

Regulation will enforce that the required knowledge and skills are met under a standardised licencing board exam, administered by an established recognised tertiary institution as well as decrease the risk of potential harm to the public.
CHAPTER THREE
METODOLOGY

3.1 Study Design
A descriptive research study was conducted. According to literature, the purpose of such a study is to gain insight into a situation, phenomenon, community or person (Lues, 2007). The need for a descriptive study could arise out of a lack of basic information on a new area of interest. A total number of 196 electronic survey questionnaires were distributed by the researcher.

3.2 Study Population and Sample
The sampling method used in this study was purposeful sampling, as participants were selected using the judgement of the researcher. Purposeful sampling allowed the researcher to select information rich participants (Marshall and Rossman, 2011). It was of utmost importance that the sample was comprised of elements most representative of the population (Strydom and Delport, 2001).

The purpose of the study was to investigate the qualification and training of laser hair removal operators within South Africa. It was therefore necessary to obtain information from a wide spectrum of participants from the Health and Skincare industry and medical professions, and therefore four separate survey questionnaires was compiled in conjunction with a statistician. The first survey questionnaire was compiled and aimed at clinic owners/managers in South Africa that offer laser hair removal therapy. The content of the survey questionnaires was aimed at acquiring information on the impact of existing training that was obtained by laser hair removal operators (Appendix A). A total number of 60 electronic questionnaires were sent (n=60). The second survey questionnaire was compiled and aimed at manufacturers that supply laser hair removal devices in South Africa, to obtain the theoretical and practical hours offered, as well as the content allocated to perform laser hair removal therapy (Appendix B). A total number of 12 electronic questionnaires were sent (n=12). The third survey questionnaire was specifically aimed at laser hair removal operators currently in the workplace, to obtain data about their qualifications and the type of laser hair removal training received (Appendix C). Contact details for laser
hair removal operators were obtained from tertiary institutions and laser clinics. A total number of 83 electronic questionnaires were sent to laser hair removal operators currently practising laser hair removal therapy (n=83). Lastly, the fourth survey questionnaire was compiled and aimed specifically at accredited tertiary institutions to obtain information about the theoretical and practical hours, the content allocated to perform laser hair removal therapy, as well as their opinion on the current regulations surrounding laser hair removal therapy in South Africa (Appendix D). A total number of 41 electronic questionnaires was sent to accredited tertiary institutions (n=41).

3.2.1 Inclusion criteria
The sampling inclusion criteria were accredited tertiary institutions that provide laser hair removal training listed on the Comité International d’Esthétique et de Cosmétologie (CIDESCO) and SAAHSP website. Skin care clinics that offer laser hair removal services listed on the open source websites of Business South Africa, South Africa Business Directory, and the Directory of South Africa Cosmetics and Skin Care. Manufacturers that supply laser devices in South Africa were obtained from the laser hair removal forum website. For laser hair removal operators, there was no exclusion based on employment period and qualification/s. This population comprised of laser hair removal operators operating laser hair removal devices of any age, gender and ethnicity, who at the time of the conduction of the study were working as laser hair removal operators within South Africa.

3.2.2 Exclusion criteria
The sampling exclusion criteria were non-accredited tertiary institutions that offer laser hair removal training, and those who were not registered with CIDESCO and SAAHSP. Laser hair removal clinics which were not registered with Business South Africa, the South African Business Directory, or the Directory of South Africa Cosmetics and Skin Care. In the case of manufacturers, those that did not supply laser hair removal devices within South Africa were excluded. Laser hair removal operators who were not based in South Africa or who did not perform laser hair removal were excluded.
3.3 Study Procedure

The surveys used in this study were created and administrated using an online platform called Survey Monkey. Survey Monkey is an online cloud based software development, founded in 1999 by Ryan Finley. Survey monkey provides customisable surveys including data analysis, bias elimination, sample selection and data representation tools (Survey Monkey, n.d).

In this study, all participants were assured by means of the cover letter that all information obtained would be confidential and made available as aggregated information (Appendix E). The cover letter, in an electronic mail, included a link to assist and gain access to the electronic survey. By clicking on the link, the participants gave their consent to take part in the survey; participants had to tick a checkbox that gave consent to participant in the research study. The survey questionnaire took ± 13 minutes to complete. Data collection for the main surveys relative to all the sources of information occurred during July 2017 to November 2017. All results were captured via Survey Monkey, which was made available only to the researcher.

3.4 Questionnaire Design

The self-design survey questionnaire comprised of mostly closed-ended questions designed to gather information regarding qualification, laser hair removal training, and opinions of current legislation and regulation of laser hair removal operators. Likert-type questions were used, in which participants were asked to respond using five alternative options ranging from ‘strongly agree’ (1) to ‘strongly disagree’ (5). There are many advantages in using this type of questioning namely, it generates a frequent response amenable for statics and analysing purposes, it was quick to answer and easy to code, and it enables comparisons to be made across groups in the samples (Cohen et al., 2007).

The four survey questionnaires were tested by means of a pilot study. The pilot study was compiled and completed before the main survey was sent. The pilot study was sent to one accredited tertiary institution, one laser manufacturer, one laser hair removal operator performing laser hair removal, and two clinic owners/managers that offer laser hair removal therapy. The survey questionnaire was subsequently
rephrased and modified according to inputs received from respondents, however minimal changes needed to be made. The duration of the pilot study was 30 days, from April 2017 to May 2017. No results of the pilot were included in the main survey results as a result of the changes that occurred.

3.5 Reliability and Validity

When a researcher pursues the measurement of a variable, the researcher needs to have the knowledge whether or not their instrument is credible and trustworthy (Bhagwan, 2002). There are two main questions identified regarding credibility when it comes to research. The first question is, whether similar results will be captured from the study if it were to be repeated by different researchers and secondly, if the same results will be obtained, and would they be correct, i.e. would the results actually measure what it intended to measure. The first question relates to reliability and the second question relates to validity (Payne and Payne, 2004). Validity can be defined as the extent in which an instrument measures what it purports to measure (Kimberlin and Winterstein, 2008). Cohen et al (2007), listed possible strategies that can be included to ensure validity:

- Emphasising the importance of the questionnaire;
- Following up on questionnaires by telephone calls or by a follow up e-mail;
- A friendly third party providing encouragement to participate;
- Understanding the nature of the sample population in depth, so that effective targeting strategies can be utilised.

These above mentioned strategies were implemented to maximise the response rate to the survey questionnaires sent to participants in this study. A pilot study was also conducted as described in section 3.4.

3.6 Ethical Considerations

For the purpose of the study, permission from the Research Ethics Committee was attained. A research proposal of this study was sent to the Faculty Research Ethics Committee whereby confirmation was given that it complies with approved ethical standards of the Faculty of Health Sciences, University of Johannesburg (Appendix F).
All surveys were completely anonymous as results were sent to the researcher without any identifying information of any respondent. Participation in the study was on a voluntary basis and participants were informed that they were free to withdraw from the study before submitting the survey without concern of retribution. Participants were unable to withdraw their consent after submitting the questionnaire as their results could not be identified nor linked to any one individual. Participants gave their consent to participate in the study by ticking a checkbox, and completing and submitting the survey through Survey Monkey. The name and contact details of the researcher and the university under whose auspices the research was done was also provided to the participants in the event that they required any further information about the study. Participants were allowed access to the results of the study on request after completion. Burns and Grove (1997) highlighted the necessity of no participants coming to any harm during the study. There were no risks involved by participating in the study, nor were there any direct benefits to the participants. The right to protection from harm and discomfort was adhered to during this study.

3.7 Data Management and Storage
Only the researcher, supervisor, co-supervisor and statistician had access to the raw data. The data was kept in the possession of the researcher electronically, and stored on a disc in a locked cabinet.

3.8 Data Analysis and Interpretation
The electronic survey was collected by the researcher on completion via Survey Monkey and analysed by STATKON, a division within the University of Johannesburg who provides a statistical consultation service. Data was analysed using descriptive techniques such as display (using visual representations of data), data reduction (the process of focusing, selecting, transforming and simplifying data) and by cross tabulating the variables.

3.9 Summary and Conclusion
The research was conducted through a descriptive study. Four separate electronic survey questionnaires were compiled for accredited tertiary institutions registered with CIDESCO and SAAHSP; clinic owners/managers that offered laser hair removal therapy; manufacturers that supply laser hair removal devices in South Africa; and
laser hair removal operators currently in the workplace performing laser hair removal therapy. The compilation of the electronic survey questionnaires was formulated based on input from members of STATKON (Appendix G). The electronic survey questionnaires were created and administrated using the online platform, Survey Monkey. A total of 196 questionnaires were sent. The percentage of completed questionnaires received were 53.65% from accredited tertiary institutions, 65% from clinic owners/managers, 100% from manufacturers that supply laser hair removal devices, and 61.44% from laser hair removal operators currently practising laser hair removal therapy. The data obtained from the questionnaires are represented in Chapter Four in the form of graphs and tables, and discussed in Chapter Five.
CHAPTER FOUR
RESULTS

4.1 Introduction
This chapter presents the data collected from four population groups involved in the research study. This enabled extensiveness and complexity in terms of data collection from multiple sources, which ultimately provided wealth and accuracy in terms of the findings made. For this study, 196 electronic survey questionnaires were distributed by the researcher, of which 122 (62.24%) electronic survey questionnaires was completed by November 2017. The electronic survey questionnaire was sent to four different population groups to obtain relevant information with regards to qualification obtained and laser hair removal training in South Africa. In the sub-sections that follow, the data and findings are presented in relation to each population.

- Population one - survey questionnaire to owners/managers of laser clinics in South Africa.
- Population two - survey questionnaire to manufacturers that supply laser devices in South Africa.
- Population three - survey questionnaire to laser hair removal operators currently in the workplace in South Africa.
- Population four - survey questionnaire to accredited tertiary institutions that offer laser hair removal training in South Africa.

4.2 Owners/Managers of Laser Clinics in South Africa
The content of the survey questionnaires was aimed at seeking quantitative information from participants on the impact of existing training that was obtained by the laser hair removal operators. The results are presented as descriptive statistics in the form of graphs.

A total number of 60 electronic questionnaires were sent to owners/ managers of laser clinics in South Africa, of which 39 (65%) responses were received. Of the 39 responses, there were 36 completed responses and three responses were partially completed. Complete responses included respondents who finished the survey and
clicked “Done” at the end of the survey. Partial responses included respondents who started the survey but did not finish. The survey questionnaire consisted of five multiple-choice questions based on a Likert scale; these are discussed below including the results.

Figure 4.1 captures the outcome of whether owners/managers of laser clinics thought that qualified laser hair removal operators from tertiary institutions who have worked at their clinic were adequately trained to perform laser hair removal therapy. The results are as follows; 33.33% strongly agree to the above statement and 33.33% agree, while 27.78% disagree and 5.56% strongly disagree.

![Figure 4.1](image)

Figure 4.1 Laser clinic owners/manager thoughts on whether qualified laser hair removal operators from tertiary institutions who have worked for their clinic are adequately trained to perform laser hair removal therapy.

Figure 4.2 provides information on the opinion of laser clinic owners/managers whether laser hair removal training should be emphasised at tertiary education. The respondents strongly agree by 66.67% and 27.78% agree, while 5.56% disagree.

![Figure 4.2](image)

Figure 4.2 The opinion of laser clinic owners/managers whether more emphasis on laser training should be placed by tertiary education facilities.
The results indicated that 86.11% of laser clinic owners/managers felt that additional laser hair removal training had to be provided to its operators after graduating from tertiary institutions (Figure 4.3).

![Figure 4.3](image-url)  The percentage of laser clinic owners/managers who had to provide additional training post-graduation.

When asked who performed additional laser hair removal training (Figure 4.4), 66.67% of laser clinic owners/managers indicated that the required additional training was provided by suppliers/manufacturers of the laser devices in South Africa. Additional training was also provided by clinic owners (36.11%) and by senior laser hair removal operators/therapist (36.11%), all of which are informal and non-credited training. However, 8.33% of the laser clinic owners/managers felt that no additional training was necessary. Respondents were allowed to have more than one answer, if they obtained additional training through multiple trainers.

![Figure 4.4](image-url)  The percentage of laser clinic owners/managers who felt that additional training was necessary and was provided for by senior laser hair removal operators, owners, and manufacturers.
Owners/managers were then asked how much additional training was required by the laser hair removal operators to be considered competent (Figure 4.5). Only 8.33% of laser owners/managers indicated that 1 to 24 hours was necessary, while 25% stated that additional training takes 1-3 days, 16.67% stated that 4 to 7 days was necessary, and 19.44% indicated that 1 to 4 weeks was necessary. Some (22.22%) owners/clinic managers indicated that additional training provided to laser hair removal operators takes more than a month before they are competent, and 8.33% felt that operators were adequately trained.

![Figure 4.5](chart.png)

**Figure 4.5** Illustration of the duration of additional training that is provided to laser hair removal operators until competency is achieved.

### 4.3 Manufacturers that Supply Laser Devices in South Africa

A total number of 12 electronic questionnaires were sent to manufacturers that supply laser devices in South Africa, of which 12 (100%) responses were received. Of the 12 survey responses, four (33.33%) were partially completed and eight (66.66%) respondents completed the survey. The main aim of this survey was to collect data of the laser hair removal training offered by manufacturers supplying laser devices in South Africa.

Respondents indicated that the duration of practical training provided by the manufacturers were as follows: 22.22% provided 1 to 5 hours practical training;
22.22% provided 6 to 10 hours practical training; 33.33% provided 16 to 20 hours; and 22.22% of manufacturers provided more than 26 hours of training (Figure 4.6). Nine respondents completed this question.

**Figure 4.6 Duration of practical training provided for laser hair removal by manufacturers in South Africa.**

Feedback received from the manufacturers regarding laser hair removal practical training, included case studies as part of their practical training i.e. case studies refer to the number of practical sessions performed on volunteers. The case study approach allows in-depth, multi-faceted explorations of complex issues in their real-life settings (Crowe *et al.*, 2011). None of the manufacturers indicated they didn’t perform any case studies, while 22.22% indicated they performed 1 to 5 case studies, 55.56% indicated they performed 6 to 10 case studies, and 22.22% indicated they performed 16 to 20 case studies in their practical training (Figure 4.7). None of the manufacturers indicated that they conducted more than 20 case studies. Nine respondents completed this question.
Figure 4.7  Number of case studies included in practical training by manufacturers.

Figure 4.8 provides the type of laser hair removal devices as well as IPL systems used in the practical training by manufacturers. Respondents indicated that 90% included IPL practical training; 80% included diode laser hair removal devices; 80% included Nd:YAG laser hair removal devices; 40% included alexandrite laser hair removal devices; 30% offered training using pulse dye lasers; and 10% used a ruby laser in their training. Respondents were allowed to have more than one answer, if they used multiple devices in their training. Ten respondents completed this question.

Manufacturers were asked to indicate the focus areas of their practical training (Figure 4.9). Results indicated that 90% of manufacturers included the face as their focus area of the body, and 100% indicated they included the body as their focus area. Therefore, on average, 95% of the respondents included practical training that involves the body and face of the volunteers. Ten respondents completed this question.
Manufacturers were asked to indicate the number of hours allocated for lecturing theory on laser hair removal therapy. The duration allocated for theoretical training by the manufacturers was 1 to 5 hours in 22.22% of the sample, and 77.78% indicated 6 to 10 hours (Figure 4.10). None of the manufacturers indicated that they gave theoretical training for more than 10 hours. Nine respondents completed this question.
The percentage distribution of the theoretical content provided by respondents is given in Figure 4.11. All of the respondents (100%) covered the following theoretical training: laser physics; mechanism of action; laser safety; skin biology; light therapy in practice; laser parameters that affect results; side effects and risks; and contraindications. Radiation-tissue interaction, hair biology and legal issues was covered by 87.50% of manufacturers, and 75% covered the theoretical content of comparing laser hair removal with other removal techniques. Eight respondents completed this question.

Figure 4.11 Theoretical content covered by manufacturers in their laser hair removal training.
Figure 4.12 and 4.13 indicates the pass mark for the theoretical and practical examination in laser hair removal training offered by manufacturers, respectively. The respondents indicated that 25% had a theoretical examination pass mark at 75%, 62.50% indicated their pass mark at 80% and above, and 12.50% of the respondents provided no theoretical examination (Figure 4.12). Eight respondents completed this question. Manufacturers indicated the following pass mark for practical examination: 12.50% indicated their pass mark was 75%, 62.50% indicated their pass mark was 80% and above, and 25% indicated there was no practical examination in order to establish the level of competency for the student or laser hair removal operator (Figure 4.13). Eight respondents completed this question.

Figure 4.12 Theoretical examinations pass mark included in the laser hair removal training provided by manufacturers.

Figure 4.13 Practical examinations pass mark included in the laser hair removal training provided by manufacturers.
Respondents were asked which National Qualification Framework (NQF) level incorporates laser hair removal training. According to the South Africa Qualification Authority (2014), NQF is a comprehensive system approved by the Minister for the classification, registration, publication and articulation of quality-assured national qualifications. The NQF is the set guidelines and principles by recording the learner's achievement. This enables national recognition of acquired skills and knowledge, thereby ensuring an integrated system that encourages life-long learning. Table 4.1 illustrates the NQF level in South Africa ranging from the highest level of education to the lowest level of education.

Table 4.1 National Qualification Framework (NQF) level, sub-frame work and qualification types (National Qualification Framework, 2015).

<table>
<thead>
<tr>
<th>NQF Level</th>
<th>Type of qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Doctoral degree</td>
</tr>
<tr>
<td></td>
<td>Doctoral degree (professional)</td>
</tr>
<tr>
<td>9</td>
<td>Master’s degree</td>
</tr>
<tr>
<td></td>
<td>Master’s degree (professional)</td>
</tr>
<tr>
<td>8</td>
<td>Bachelor’s honour degree</td>
</tr>
<tr>
<td></td>
<td>Postgraduate Diploma</td>
</tr>
<tr>
<td></td>
<td>Bachelor’s degree</td>
</tr>
<tr>
<td>7</td>
<td>Bachelor’s degree</td>
</tr>
<tr>
<td></td>
<td>Advance diploma</td>
</tr>
<tr>
<td>6</td>
<td>Diploma advanced certificate</td>
</tr>
<tr>
<td>5</td>
<td>Higher certificate</td>
</tr>
<tr>
<td>4</td>
<td>National/Senior Certificate</td>
</tr>
<tr>
<td>3</td>
<td>Intermediate Certificate</td>
</tr>
<tr>
<td>2</td>
<td>Elementary Certificate</td>
</tr>
<tr>
<td>1</td>
<td>General Certificate</td>
</tr>
</tbody>
</table>

According to the feedback received, 33.33% of manufacturers incorporates laser hair removal at a NQF level 4; 16.67% incorporates the laser hair removal training at NQF level 10; and 50% does not require the individual to have any type of NQF level to undergo laser hair removal training (Figure 4.14). Six respondents completed this question.
4.4 Laser Hair Removal Operators in South Africa

A total number of 83 electronic questionnaires were sent to laser hair removal operators currently practising laser hair removal therapy. Of the 83 questionnaires sent, 51 replies were received. There were 49 (96.07%) completed responses and two (3.92%) partially completed responses. The aim of the survey was to obtain information on qualification obtained and the type of training received by laser hair removal operators utilising laser hair removal devices in South Africa.

Figure 4.15 and Figure 4.16 indicates respondents’ highest qualification and the institution where the qualification was obtained. The qualification with the lowest representation amongst the respondents were High School Senior Certificate NQF level 4 (4.08%), followed by a two year Certificate in Skin Care Therapy NQF level 5 (18.37%). The three year college level Diploma in Skin Care Therapy NQF level 5 or 6 amounted to 42.86%, a three year university Diploma in Skin Care Therapy NQF level 6 was at 24.49%, and 10.20% obtained a fourth year university Bachelor Degree in Skin Care Therapy or an equivalent NQF level 7. None of the respondents indicated that they had a Master’s Degree in skin care (Figure 4.15). Forty nine respondents completed this question.
Figure 4.15 Highest qualification obtained by laser hair removal operators in South Africa.

Laser hair removal operators indicated that 84.42% of them obtained their qualification through a private institution, 20% obtained their qualification through a University of Technology, and 2.22% obtained their qualification through a Technical college (Figure 4.16). Respondents were allowed to have more than one answer, if they obtained a qualification through multiple institutions. Forty five respondents completed this question.

Figure 4.16 Institutions where laser hair removal operators qualified.

It was found that 68.89% of respondents were trained in laser hair removal by a lecturer at the institution they qualified from, however the question did not specify if it was practical and theory training, or only theory or practical training. There were 24.44% of respondents whom received their training from manufacturers that supply laser devices in South Africa, while 20% of the respondent indicated that they
received training by the clinic owners, and 13.33% indicated they received training from a senior laser hair removal operator/therapist (Figure 4.17). None of the laser hair removal operators indicated that they were self-taught. Respondents were allowed to have more than one answer if they received training through multiple sources. Forty five respondents completed this question.

![Figure 4.17 Illustration of where laser hair removal operators received their laser hair removal training from.](image)

The duration of theoretical hours that the respondents received were as follows: 2.13% received more than 30 minutes but less than an hour; 34.04% received 1 to 5 hours; 21.28% received 6 to 10 hours; 12.77% received 11 to 15 hours; 8.51% received 16 to 20 hours; 4.26% received 21 to 25 hours; 12.77% received more than 26 hours; and 4.26% received no theory training (Figure 4.18). Forty seven respondents completed this question.

Laser hair removal operators were asked to indicate the duration of the practical training hours received before they were considered competent to perform laser hair removal therapy (Figure 4.19). It was found that 36.17% of respondent did not receive any practical laser hair removal training by the institution they qualified from, whereas 17.02% indicated they received more than 26 hours. Just less than 47% of respondents (46.81%) indicated that they had received 25 hours and less. Forty seven respondents completed this question.
Figure 4.18 Duration of theoretical hours on laser hair removal provided for to the respondents.

Figure 4.19 Duration of practical training received by laser hair removal operators from their tertiary institution.

Figure 4.20 provides the type of laser removal devices used in the practical training received by laser hair removal operators. The results were as follows: 12.24% indicated that a ruby laser was used; 14.29% indicated an alexandrite laser was used; 22.45% indicated that a diode laser was used; 24.49% indicated that a Nd:YAG laser was used; 8.16% indicated that a pulse dye laser was used; 51.02% indicated that IPL was used; and 42.86% of respondents indicated that no practical training was included. Respondents were allowed to have more than one answer, if multiple devices were used in their laser practical training. Two of the respondents
indicated all of the options; it could be assumed they misread the question. Forty nine respondents completed this question.

Laser hair removal operators were asked to indicate their number of years’ experience performing laser hair removal therapy (Figure 4.21). The results indicated that 32.65% had less than one years’ experience; 14.29% had 1 to 3 years’ experience; 6.12% had 4 to 6 years’ experience; 2.04% had 7 to 10 years’ experience; 2.04% had more than 11 years’ experience; and 42.86%, had no experience in performing laser hair therapy.

Forty nine respondents completed this question. Respondents were asked to respond to the statement, ‘The amount of training on laser hair removal from your tertiary institution was sufficient.’ A Likert scale was used to obtain this information. The results were as follows: 28.26% strongly disagreed, and 32.61% disagreed to the above statement, whereas 28.26% agreed and 10.87% strongly agreed to the above statement (Figure 4.22). Forty six respondents completed this question.
4.5 Tertiary Institutions Offering Laser Hair Removal Training in South Africa

A total number of 41 electronic questionnaires were sent to accredited tertiary institutions that offer laser hair removal training in South Africa, of which 22 (53%) responses were received. Of these 22 respondents, there were 19 completed responses and three partially completed responses, with only some questions answered.

Figure 4.23 indicates the number of tertiary institutions listed on the CIDESCO and SAAHSP databases, 72.22% of the respondent institutions offers no laser hair
removal training, and 27.78% indicated they do offer laser hair removal training. Eighteen respondents completed this question.

![Figure 4.23](image-url) **Figure 4.23** Percentage of accredited tertiary institutions in South Africa that offers laser hair removal training.

Of the 27.78% tertiary institutions that responded that they offered laser hair removal training, 16.67% offered theoretical training of more than 30 minutes but less than one hour, 33.33% indicated their theoretical training was 6 to 10 hours, and 50% indicated a duration of 11 to 15 hours for theoretical training in laser hair removal (Figure 4.24).

![Figure 4.24](image-url) **Figure 4.24** Duration spent on theoretical training by tertiary institutions on laser hair removal.

The percentage distribution of the theoretical content provided by tertiary institutions is given in Figure 4.25. All of the respondents (100%) covered the following
theoretical training: laser physics; mechanism of action; radiation-tissue interaction; laser safety; skin biology; light therapy in practice; hair biology; laser parameters that affect results; side effects and risks; and contraindications. Whereas 83.33% responded that comparisons with other removal techniques was included, and 66.67% of the respondents included legal issues in their theoretical training.

Figure 4.25 Theoretical content covered by tertiary institutions in their laser hair removal training.

Tertiary institutions were requested to indicate the pass mark for the theoretical examination in laser hair removal training (Figure 4.26). The respondents indicated that 83.33% had a theoretical examination pass mark at 50%, and 16.67% indicated their pass mark for their theory examination is at 70%.

Respondents indicated that the duration of practical training provided for by tertiary institutions were as follows: 20.00% performed practical training less than 30 minutes, 20% provided 1 to 5 hours practical training, 20% provided 6 to 10 hours, 20% provided training of more than 26 hours, and 20% provided no practical training for the students (Figure 4.27). One respondent fail to answer the question.
Figure 4.26 Theoretical examinations pass mark included in the laser hair removal training provided by tertiary institution.

Figure 4.27 Duration of practical training provided by tertiary institutions.

Figure 4.28 provides the type of laser hair removal devices as well as IPL systems used in the practical training by tertiary institutions. The following was the outcome: 50% of all respondents included diode lasers; 16.67% included Nd:YAG lasers; 33.33% included IPL; 16.67% included alexandrite lasers; and 33.33% offered no practical training in laser hair removal to their students. Respondents were allowed to have more than one answer, if they included multiple devices in their training. Six respondents completed this question.
The following number of case studies was included in tertiary institutions practical training: 50% included 1 to 5 case studies; 16.67% included 6 to 10 case studies; and 33.33% offered no practical training in laser hair removal for students (Figure 4.29).

Tertiary institutions were asked to indicate the focus areas of their practical training (Figure 4.30). The results indicated that 50% of institutions included the face as their focus area, 66.67% indicated they included the body as their focus area, and 33.33% offered no practical training in laser hair removal for students.
Tertiary institutions were requested to indicate the pass mark for the practical examination in laser hair removal training (Figure 4.31). Respondents indicated the following pass marks: 33.33% indicated their pass mark was at 50%, 16.67% indicated their pass mark was 70% and 50% indicated there was no practical examination in order to establish the level of competency for the student.
Respondents were asked which NQF level incorporates their laser hair removal training. According to the feedback received, 16.67% of the respondents incorporate laser hair removal at a NQF level 5, 66.67% incorporated laser hair removal at a NQF level 6, and 16.67% incorporated laser hair removal at a NQF level 7 (Figure 4.32).

![Figure 4.32 National Qualification Framework (NQF) level that incorporates laser hair removal training.](image)

Tertiary institutions were asked if they thought that industry should have standard requirements in terms of minimum practical and theoretical hours with regards to laser hair removal therapy (Figure 4.33). A Likert scale was used to obtain this information. All the respondents in this sample (100%) strongly agreed to the above statement. Tertiary institutions were asked whether they thought that the regulation of laser hair removal services by an established Regulatory Board would help to create unified standards that apply to all laser hair removal operators. A Likert scale was used to obtain this information. The majority of respondents (83.33%) strongly agreed, while 16.67% neither agreed nor disagreed to the above statement (Figure 4.34).
Figure 4.33 Tertiary institutions opinion to the following statement was asked, ‘The industry should have standard requirements in terms of minimum practical and theoretical hours with regards to laser hair removal therapy.’

Figure 4.34 Tertiary institutions opinion to the following statement was asked, ‘The regulation of laser hair removal services by an established Regulatory Board would help to create unified standards that applies to all laser hair removal operators.’
CHAPTER FIVE
DISCUSSION AND CONCLUSION

5.1 Introduction

The main aim of the research study relates to ‘The qualification and training of laser hair removal operators within South Africa’. From this title, key findings made in the study are discussed in this chapter including cross tabulation results, conclusion and recommendations.

The major findings are summarised and discussed within the context of the following four research objectives.

- To obtain information from laser clinic owners/managers in South Africa on the impact of existing training received by laser hair removal operators.
- To determine the theoretical hours, practical hours and theoretical content allocated for training in laser hair removal by manufacturers that supply laser devices in South Africa.
- To determine the type of laser hair removal training received by laser hair removal operators currently in the workplace.
- To determine the theoretical hours, practical hours and theoretical content allocated for training in laser hair removal by accredited tertiary institutions in South Africa.

5.1.1 Information from laser clinic owners/managers in South Africa on the impact of existing training received by laser hair removal operators

According to the results of the survey received from owners/managers of laser hair removal clinics, a significant amount (86.11%) indicated that additional laser hair removal training was required after the student completed their tertiary studies. The additional training could relate to specific training to the laser device that may be used in the clinic, or comprehensive laser hair removal training. In the same survey, more than 90% of clinic owners/managers indicated that there should be more emphasises on laser hair removal training at tertiary institutions. However, in contradiction to this, two-thirds (66.66%) of the sample indicated they thought that
the majority of qualified laser hair removal operators from tertiary institutions who work at their clinics were adequately trained to perform laser hair removal.

To better interpret the contradicting feedback received from clinic owners/managers, three cross tabulation tables were used to aggregate and conjointly demonstrate two or more variables by tabulating their results one against the other in 2-dimentional grids. Table 5.1 indicates the cross tabulation results of the statement, ‘Qualified laser hair removal operators from tertiary institutions who have worked for our clinic are adequately trained to perform laser hair removal therapy’ and the question ‘Does the clinic often have to provide additional training in laser hair removal to laser hair removal operators?’ Table 5.2 indicates the cross tabulation results of the statement, ‘Qualified laser hair removal operators from tertiary institutions who have worked for our clinic are adequately trained to perform laser hair removal therapy’ and the statement, ‘There should have been more emphasis on laser training during the tertiary education of laser hair removal operators’. Table 5.3 indicates the cross tabulation results of the statement, ‘There should have been more emphasis on laser training during the tertiary education of laser hair removal operators and the question ‘Does the clinic often have to provide additional training in laser hair removal to laser hair removal operators?’.

Table 5.1 Cross tabulation of results received by clinic owners/managers with respect to additional training provided in relation to whether qualified laser hair removal operators were adequately trained in laser hair removal therapy.

<table>
<thead>
<tr>
<th>Qualified laser hair removal operators from tertiary institutions who have worked for our clinic are adequately trained to perform laser hair removal therapy.</th>
<th>Agree</th>
<th></th>
<th>Disagree</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>19</td>
<td>5</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>% within Q1 Qualified laser hair removal operators from tertiary institutions who have worked for our clinic are adequately trained to perform laser hair removal therapy.</td>
<td>79.2%</td>
<td>20.8%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Count</td>
<td>12</td>
<td>0</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>% within Q1 Qualified laser hair removal operators from tertiary institutions who have worked for our clinic are adequately trained to perform laser hair removal therapy.</td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>31</td>
<td>5</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>% within Q1 Qualified laser hair removal operators from tertiary institutions who have worked for our clinic are adequately trained to perform laser hair removal therapy.</td>
<td>86.1%</td>
<td>13.9%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5.2 Cross tabulation of results received by clinic owners/managers with respect to whether qualified laser hair removal operators were adequately trained in laser hair removal therapy in relation to whether more emphasis should be placed on laser training at tertiary institutions.

<table>
<thead>
<tr>
<th>Qualified laser hair removal operators from tertiary institutions who have worked for our clinic are adequately trained to perform laser hair removal therapy.</th>
<th>Agree</th>
<th>Disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>Count</td>
<td>22</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>% within Q1 Qualified laser hair removal operators from tertiary institutions who have worked for our clinic are adequately trained to perform laser hair removal therapy.</td>
<td>91.7%</td>
<td>8.3%</td>
</tr>
<tr>
<td>Disagree</td>
<td>Count</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>% within Q1 Qualified laser hair removal operators from tertiary institutions who have worked for our clinic are adequately trained to perform laser hair removal therapy.</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>34</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>% within Q1 Qualified laser hair removal operators from tertiary institutions who have worked for our clinic are majority adequately trained to perform laser hair removal therapy.</td>
<td>94.4%</td>
<td>5.6%</td>
</tr>
</tbody>
</table>

Table 5.3 Cross tabulation of results received by clinic owners/managers with respect to whether laser training should be emphasised during tertiary education in relation to whether the clinic provides additional laser hair removal training.

<table>
<thead>
<tr>
<th>There should have been more emphasis on laser training during the tertiary education of laser hair removal operators.</th>
<th>Agree</th>
<th>Disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>Count</td>
<td>30</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>% within Q2 They should have been more emphasis on laser training during their tertiary education of laser hair removal operators.</td>
<td>88.2%</td>
<td>11.8%</td>
</tr>
<tr>
<td>Disagree</td>
<td>Count</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>% within Q2 They should have been more emphasis on laser training during their tertiary education of laser hair removal operators</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>31</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>% within Q2 They should have been more emphasis on laser training during their tertiary education of laser hair removal operators</td>
<td>86.1%</td>
<td>13.9%</td>
</tr>
</tbody>
</table>

Based on the outcomes from the cross tabulation of the contradicting feedback dealing with training of laser hair removal operators by clinic owners/managers, the following can be deduced.
• In Table 5.1, 79.20% of respondents agreed that qualified laser hair removal operators working at their clinics are adequately trained, but needed additional training. A possible reason for this could be that additional training is required on specific laser devices used at the particular clinic.
• In Table 5.2, 91.70% of respondents agreed that qualified laser hair removal operators working at their clinics are adequately trained, but also agreed there should be more emphasis placed on laser training by tertiary institutions. A possible reason for the contradiction could be that qualified laser hair removal operators were perceived to be adequately trained after additional laser training was provided by the clinic, as the statement does not specify whether they are adequately trained with or without additional training.
• In Table 5.3, a total of 88.20% of respondents agreed that more emphasis should be placed on laser training at tertiary institutions. This could indicate insufficient training in at tertiary education, therefore additional training needs to be provided for the laser hair removal operators.

According to the feedback given, 66.67% of additional training is provided by the manufacturer of laser devices. The advantage of laser training by manufacturers is that it is machine specific, which could ensure proper functioning and maintenance of these devices. However, there are many disadvantages for a business when utilising manufacturer laser training, one being there is no standard to measure the level of competency as it is informal training. This could pose a risk to potential clients undergoing laser hair removal treatment, which may lead to possible litigation. In a study conducted by Jalian et al., (2014), nearly 200 cosmetic laser surgery lawsuits were reviewed. The data suggested an increase in risk of injury by non-physician laser operators. Laser hair removal was the most common procedure resulting in litigation and injury. From 2008 to 2012, 86% of laser hair removal litigation involved non-physician operators, and from 2010 to 2012, 90% of laser hair removal cases were performed by non-physician operators. The allegations relating to injury sustained was as a result of inadequate training.
5.1.2 To determine the theoretical hours, practical hours and theoretical content allocated for training in laser hair removal by manufacturers

It was previously indicated in section 5.1.1 that 66.67% of additional training was provided by manufacturers of laser hair removal devices. The manufacturers that responded to the survey may not be the same as those that provided the additional training indicated by clinic owners/managers; however, clinic owners/managers are seeking additional training from manufacturers to enhance the competency of laser hair removal operators.

The results of the survey from manufacturers has shown that more than 75% of the respondents provide less than 21 practical hours; and 100% of respondents provide less than 11 hours on theory during laser hair removal training. No formal accreditation is provided when being trained by a laser device manufacturer. In South Africa, there are no minimum practical requirements as a prerequisite to perform laser hair removal procedures, although SAAHSP does stipulate a minimum of 100 hours of theoretical and practical training as a recommended guideline. In other parts of the world, to ensure that competent laser hair removal operators are allowed to perform laser hair removal procedures, minimum practical and theoretical requirements are an essential prerequisite. Mandatory hours may ensure safe practice of these medical devices as the operator would understand the functionality of the machine, the physiological effect it has on the body, and precautions to minimise risk to the public.

Below are examples of international standards:

- Laser technicians in Arizona are required to perform 24 hours of practical supervision on laser and IPL devices before being competent in performing laser hair removal (Arizona Revised Statutes, 2014).
- In Texas, it is required that laser hair removal technicians perform at least 100 laser hair removal procedures under supervision (Texas Department of Licensing and Regulation, 2017).
- In Florida, candidates are required to complete a 30 hour continuing education course approved by the Electrolysis Council, and a minimum of five hours practical experience in laser and light based devices. The requirements
for completion of practical hours are however far less than that of Texas and Arizona, but candidates are required to pass the Society for Clinical and Medical Hair Removal examination to acquire certification as a Certified Medical Electrologist. Once certified, the electrologist must operate under the direct supervision of a trained physician (Florida Department of Health, 2014).

Based on the survey results, half (50%) of the respondents did not require any form of formal qualification as a minimum requirement to be trained on laser hair removal procedures and devices, therefore anyone without any NQF level can be trained to use these devices. Addition to this, 33.33% indicated laser hair removal training is incorporated at a NQF level 4 (National/Senior Certificate). The manufacturers that participated in the study have indicated they provide theoretical examination (87.50%) as well as practical examination (75%). This expresses some desire by manufacturers to determine the level of knowledge and practical skill gained through the training provided, however, passing these examinations has no recognition in industry and does not provide any form of formal accreditation. It is difficult to monitor and achieve consistent training standards, which can become problematic, when training is being offered by unregistered and unaccredited training providers. This could increase the risk of damaging the profession as well as increase injury risk to the public.

One way manufacturers can add value to their training is if they provide their training through an accredited tertiary institution. This will allow their course to be part of the credit system. A credit system is a systematic method of describing an educational programme by assigning credits to its components. Credit measures the volume of learning required for a qualification. Credits may be based on student workload, contact hours and learning outcomes in higher education systems (Council on Higher Education, 2016). Upon this, formal examination can be done with the appropriate level of difficulty.

5.1.3 To determine the type of laser hair removal training received by laser hair removal operators currently in the workplace

According to the survey results, majority of the respondents (84.42%) working with laser and IPL devices received there qualification from a private institution and
42.86% indicated that laser training formed part of their three year College level Diploma in Skin Care Therapy (NQF 5 or 6). Most of the respondents (60.87%) felt the amount of training on laser hair removal from their tertiary institution was insufficient. A cross tabulation was done in order to establish qualification level of respondents and whether the amount of laser hair removal training was sufficient. The result of the cross tabulation has shown 46.40% of respondents who received a three year College level Diploma in Skin Care Therapy felt their training was insufficient (Table 5.4).

Table 5.4 Cross tabulation of results received by laser hair removal operators with respect to the sufficiency of laser hair removal training from your tertiary institutions in relations to the highest level of qualification.

<table>
<thead>
<tr>
<th>The amount of training on laser hair removal from your tertiary institution was sufficient</th>
<th>Disagree</th>
<th>Count</th>
<th>2 year College level Diploma in skin care therapy</th>
<th>3 year College level Diploma in skin care therapy</th>
<th>3 year University Diploma in skin care therapy</th>
<th>4 year University Bachelor Degree in skin care therapy</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>% within Q9 The amount of training on laser hair removal from your tertiary institution was sufficient</td>
<td>Count</td>
<td>4</td>
<td>9</td>
<td>1</td>
<td>1</td>
<td>15</td>
<td>100%</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>Count</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>13</td>
<td>100%</td>
</tr>
<tr>
<td>% within Q9 The amount of training on laser hair removal from your tertiary institution was sufficient</td>
<td>26.7%</td>
<td>60.0%</td>
<td>6.7%</td>
<td>6.7%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>8</td>
<td>13</td>
<td>4</td>
<td>3</td>
<td>28</td>
<td>100%</td>
</tr>
<tr>
<td>% within Q9 The amount of training on laser hair removal from your tertiary institution was sufficient</td>
<td>28.6%</td>
<td>46.4%</td>
<td>14.3%</td>
<td>10.7%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional cross tabulations were done to find possible reasons for this outcome. As indicated in Table 5.5, the majority of the respondents (42.9%) who disagreed and strongly disagreed to the statement ‘The amount of training on laser hair removal from your tertiary institution was sufficient’ only received 1 to 5 hours theoretical training on laser hair removal. Furthermore, the majority of respondents (46.40%) who disagreed and strongly disagreed to the above statement had no practical training on laser hair removal, as it was not provided by the tertiary institution (Table 5.6). The results to survey has also shown, respondents that did not receive sufficient practical training had acquired laser training from laser manufacturers.
(24.44%), senior laser hair removal operators (13.33%) or clinic owners (20%). These types of training are all informal and non-accredited. However, if tertiary institutions are providing insufficient practical and theoretical training, then informal training may be the only option. There is always a risk of complications when performing laser hair removal treatments, but it could be magnified when individuals with insufficient training are required to perform these treatments.

Table 5.5 Cross tabulation of results received by laser hair removal operators with respect to the sufficiency of laser hair removal training from your tertiary institutions in relation to the duration of theoretical training.

| The amount of training on laser hair removal from your tertiary institution was sufficient | Disagree | Count | <30 minutes but <1 hour | 1-5 hours | 6-10 hours | 11-15 hours | 16-20 hours | 21-25 hours | More than 26 hours | No theory training provided | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| % within Q22 The amount of training on laser hair removal from your tertiary institution was sufficient | 0% | 53.3% | 26.7% | 6.7% | 6.7% | 6.7% | 0% | 0% | 100% |
| Strongly disagree | Count | 1 | 4 | 3 | 2 | 0 | 0 | 1 | 2 | 13 |
| % within Q22 The amount of training on laser hair removal from your tertiary institution was sufficient | 7.7% | 30.8% | 23.1% | 15.4% | 0% | 0% | 7.7% | 15.4% | 100% |
| Total | Count | 1 | 12 | 7 | 3 | 1 | 1 | 1 | 2 | 28 |
| % within Q22 The amount of training on laser hair removal from your tertiary institution was sufficient | 3.6% | 42.9% | 25% | 10.7% | 3.6% | 3.6% | 3.6% | 7.1% | 100% |
Performing laser hair removal procedures under the direct supervision of a medical practitioner or a trained physician is not a mandatory requirement in South Africa, as is the case in countries mentioned (Arizona, Florida). There are advantages of having direct supervision because the supervisor is required to ensure the following outcomes are met (Federation of State Medical Boards, 2012):

- Ensure health and safety practical procedures are adhered to.
- Ensure correct protocols are followed.
- Ensures that clients are informed of expectation of the treatment.

Table 5.6 Cross tabulation of results received by laser hair removal operators with respect to the sufficiency of laser hair removal training from your tertiary institutions in relations to the duration of practical training.

<table>
<thead>
<tr>
<th></th>
<th>Less than 30 minutes</th>
<th>More than 30 minutes but less than an hour</th>
<th>1 - 5 hours</th>
<th>6 - 10 hours</th>
<th>11 - 15 hours</th>
<th>21 - 25 hours</th>
<th>More than 26 hours</th>
<th>No practical training provided</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>The amount of training on laser hair removal from your tertiary institution was sufficient</td>
<td>Disagree</td>
<td>Count</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>% within Q22 The amount of training on laser hair removal from your tertiary institution was sufficient</td>
<td>0%</td>
<td>13.3%</td>
<td>6.7%</td>
<td>13.3%</td>
<td>0%</td>
<td>6.7%</td>
<td>13.3%</td>
<td>46.7%</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>Count</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>% within Q22 The amount of training on laser hair removal from your tertiary institution was sufficient</td>
<td>30.8%</td>
<td>0%</td>
<td>7.7%</td>
<td>0%</td>
<td>7.7%</td>
<td>0%</td>
<td>7.7%</td>
<td>46.2%</td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>% within Q22. The amount of training on laser hair removal from your tertiary institution was sufficient</td>
<td>14.3%</td>
<td>7.1%</td>
<td>7.1%</td>
<td>7.1%</td>
<td>3.6%</td>
<td>3.6%</td>
<td>10.7%</td>
<td>46.4%</td>
</tr>
</tbody>
</table>
• Ensure all necessary consent forms are complete and that it outlines possible side effects and complications which may result from the treatment.
• Evaluates the technical skills of the delegate performing the treatment.
• To protect the best interest and welfare of each client.
• Attends to, evaluates, and treats complications that may arise.
• The supervising physician is on-site and readily available to respond to any question or problem that may occur during the procedure.

The results of survey also indicated that 42.86% of laser hair removal operators currently in the workplace have no experience working with laser devices. Direct supervision could be beneficial to those individuals that have no experience in laser hair removal therapy, to ensure correct functionality of laser devices and precautions, and laser treatment protocols are adhered to.

5.1.4 To determine the theoretical, practical hours and content allocated for training in laser hair removal by accredited tertiary institutions in South Africa

The accredited tertiary institutions that participated in the study indicated that 72.22% of these institutions do not offer laser hair removal training, which is a concern because the popularity of this therapy is on the increase. One possible inhibiting factor for tertiary institutions not offering laser hair removal training is the high cost and maintenance of laser devices. Of the 27.78% that indicated they do provide laser hair removal training, 100% offers less than 16 hours theoretical training, and 60% provides less than 11 hours of practical training. As previously mentioned in section 2.4.2, this amount is far less than international mandatory hour requirements, as well as the hours stipulated by SAAHSP as a minimum guideline for practical and theory training.

Tertiary institutions that responded to the survey indicated they provide theoretical examination, however there is no consistency in the standard pass mark because 83.33% indicated a pass mark of 50%, while 16.67% indicated a pass mark of 70%. The study also showed that half (50%) of tertiary institutions that responded do not offer a practical examination in laser hair removal to measure the level of
competency of the students. For those that mentioned they do offer a practical examination, the pass mark varies from 50% to 70%. From the survey results, there is a general inconsistency in laser training at tertiary institutions, which does not allow a standard to be set across the country. However, it was clear that all the respondents (100%) felt that the industry should have standard requirements in terms of minimum practical and theoretical hours in relation to laser hair removal training. The respondents strongly agreed (83.33%) that the regulation of laser hair removal services by an established regulatory board would help to create unified standards that would apply to all laser hair removal operators.

In other countries where mandatory hours are not a prerequisite, there are regulatory boards governing laser hair removal operators that perform laser hair removal procedures, namely:

- Radiation Health, Health Protection Unit, Queensland Health, is the regulatory body in Queensland, Australia (Queensland Health, 2015).
- Radiation Protection Unit, Department of Health and Human Services, is the regulatory body in Tasmania, Australia (Department of Health and Human Services, 2015).
- Radiological Council, Department of Health, is the regulatory body in Western Australia (Government of Western Australia, 2012).
- Arizona the Radiation Regulatory Agency, is the regulatory body in Arizona, USA (Arizona Revised Statutes, 2014).

5.2 Conclusion
Most of the clinic owners/ managers surveyed felt that more emphasis should be placed on laser hair removal training at a tertiary level, as additional laser training had to be provided to accommodate the shortfall in the individual's initial training. The type of additional training received is informal and non-accredited, and thus there is no standard guideline to measure the level of competency of the laser hair removal operators. Not being able to measure competency may lead to malpractice. The effects of malpractice on clients could damage the reputation of the business as well as the profession’s image. Concerns regarding negligence can make clients nervous about laser therapy, which in turn could affect the business financially.
Proper training of laser hair removal operators that perform laser hair removal is vital to prevent malpractice and ensure a standard of ethics.

The majority of laser manufacturers offering training on laser hair removal are providing less practical hours and theoretical training compared to countries that prescribe mandatory hours in laser hair removal. This may lead to inadequately trained laser hair removal operators. The inconsistency in the minimum requirement for laser hair removal operators to be trained in laser hair removal is concerning, because half of the respondents had no minimum requirement at all. Understanding the physiological process of laser treatments, as well as the science and physics behind the practical procedures, requires a higher order of thinking which involves analysing, evaluating, problem solving and critical thinking. Informal examinations are offered by laser manufactures however, it holds no formal value and passing these examinations is not recognised in industry. The informal training and examination is not standardised and inconsistent. Manufacturers could provide training through short courses at tertiary institutions, which will allow their course to be part of the credit system.

The majority of laser hair removal operators currently in the workplace have indicated theoretical training of 1 to 5 hours, and more concerning, a majority indicated no practical training was provided at their tertiary institution. Industry is relying on informal laser training, with no formal method of measuring competency or any form of accreditation. If laser hair removal operators receive informal training, significant guidance will be needed to ensure safe practise. Direct supervision is not a mandatory requirement when performing laser hair removal in South Africa. Alarmingly, the majority of the respondents currently in the workplace have no prior experience in the treatment of laser hair removal, with 4% having no formal tertiary education training/qualification. This may indicate that laser clinics are employing unskilled, untrained and unqualified individuals to perform procedures such as laser hair removal. Placing inexperienced hands on a laser device could result in injury to a client, which can lead to traumatic experiences for both parties involved.

Even more startling is the fact that the bulk (72.22%) of the tertiary institutions surveyed does not offer laser hair removal training. This is a concern due to the
popularity of the treatment, as well as laser hair removal operators wanting to perform laser removal treatments will need to seek informal training while in industry. The tertiary institutions surveyed that does provide training is much less than international countries that require mandatory hours, the lack of training may lead to laser hair removal operators entering the workplace inadequately trained to perform these medical procedures. Having inexperienced and poorly trained laser hair removal operators puts the public at risk to burns, scars and pigmentary changes. The tertiary institutions surveyed have acknowledged that industry should have standard requirements in terms of minimum practical and theoretical hours in relation to laser hair removal training. In order to meet standard requirements, it needs to be developed through a regulatory board that regulates laser hair removal operators who can perform laser hair removal treatment and what training is needed. Tertiary institutions surveyed also acknowledged that regulation of laser hair removal services by an established regulatory board would help to create unified standards that apply to all laser hair removal operators. There is a need for intervention to fully train students at institutions, as they are expected to perform laser hair removal treatments at aesthetic clinics as well as a larger cause to protect the public from injury.

In conclusion, laser hair removal is fast becoming the leading therapy option for long–term results and the popularity of the treatment is on the rise. Laser hair removal is not risk-free and side effects are associated with the treatment. Adequate training is essential to minimise adverse side effects. In many countries such the United States of America, Australia and the United Kingdom, this is dealt with by regulating the industry, with severe penalties for non-compliance. However, in South Africa the opposite exists. There is a clear lack in training in laser hair removal offered by accredited tertiary institutions, placing inexperienced and poorly trained laser hair removal operators into the workforce. There is also no minimum qualification placed on individuals receiving laser hair removal training, and anyone with little or no qualification is allowed to perform laser hair removal treatments. Having inexperienced and poorly trained laser hair removal operator puts the public at risk to burns, scars and pigmentary changes, and taint the industry. There is an unmistakable need for the industry to be regulated, with mandatory training hours and standards to be set out for high at-risk procedures, such as laser hair removal.
5.3. Recommendations

The following recommendations may assist in standardisation, regulation and public protection associated with laser hair removal:

- Self–regulation by industry.
- Registration of service providers based on prior qualification and training.
- Educational awareness.

5.3.1 Self-regulation by industry

One of the main reasons government might regulate a profession is for the protection of the public. A self-regulation model based on an occupational group entering into an agreement with government to formally regulate the activities of its members (Human Resources Professionals Association, 2015) or a profession can also be self-regulating without legislative support. In these cases, individuals of the profession organise themselves to establish and monitor education, practice, and ethical standards for the profession (Healy, 2014). There are three levels of regulation: registration, certification and licensing. Regulation will require professionals to be listed on an authorised register, while licensure is the most restrictive as it provides control over an occupational group, with regards to who can practice a profession. It often includes achieving specific educational requirements and completion of a licensing examination (Randall, 2000). To pursue self-regulation, it begins with a voluntary association who are interested in enhancing the status and credibility of a profession. The body can create a standard of practice, code of ethics and conducts, and educational standards. Self-regulation will allow the development of safety guidelines and standards for the use of laser hair removal devices, and such standards can include criteria and requirements for training. This option is not mandatory, but depends on the will of the industry to comply with the safety guidelines and willingness of the laser operators to join in an accreditation scheme that is not obligatory.

5.3.2 Registration of service providers based on prior qualification and training

This involves licensing of laser hair removal operators only if appropriate training is completed. Qualification and training would form the basis of licensing. The licensing
will indicate which procedures can be performed and which devices can be used.

Recommendation of qualification and practical requirements are as follows:

- Accredited laser and IPL safety course.
- Nationally recognised education and training institution.
- Minimum pre-requisite: 3 year National Diploma in skin care or equivalent (NQF 6).

Theoretical education must include:
Laser physics, mechanism of action, comparisons with other removal techniques, radiation-tissue interactions, laser safety, skin biology, light therapy in practice, hair biology, legal issues, laser parameters that affects results, side effects and risks and contraindications.

Practical education must include:
Minimum of 50 hours under direct supervision. Must practise on different Fitzpatrick skin types and all procedures should be signed off in a clear log book.

Licensure will allow some form of standardisation and regulation of who can perform procedures with these medical devices. In Tasmania, Western Australia and Queensland, applicants are required to demonstrate evidence of appropriate knowledge of safety, qualification and competency before being licenced to perform laser hair removal procedure (Consultation Regulatory Impact Statement, 2015).

Short courses that are currently available in laser hair removal and IPL procedures are:

- The online Laser Training distance-learning course. This module provides the fundamental understanding of laser and light technology, how light interacts with skin to produce specific biological effects and how to use laser and intense pulsed light (IPL) devices safely. This is an independently accredited level 4 (NQF 6) course. The online course is worth 30 Continued Professional Development (CPD) learning credits in the UK and 18 CPD points in Australia & New Zealand (Online laser training, 2017). The purpose of CPD is "to assist health professionals to maintain and acquire new and updated levels of knowledge, skills and ethical attitudes that will be of measurable benefit in
professional practice and to enhance and promote professional integrity” (South Africa Medical Association, 2017).

- The Confederation of International Beauty Therapy and Cosmetology (CIBTAC) is an internationally recognised body for the beauty and aesthetics sector and offers a level 4 (NQF 6) laser and light qualification to laser/IPL operators. This qualification is suitable for nurses, doctors and some other allied health care professionals, as well as skincare therapists with a Beauty National Vocation Qualification (NVQ) level 3 (NQF 5) or similar (Lynton, 2017).

- A course in Nd:YAG lasers, level 4 (NQF 6), is offered by the Academy of Beauty Training and requires a Beauty Therapy (level 2 and 3) (NQF 4 and 5) pre-requisite, or a medical qualification (doctors, dentist or nurse). CPD points gained with this course are at 84.

- The Vocational Training Charitable Trust (VTCT) offers a level 4 (NQF 6) qualification in laser and IPL treatments. Entry requirements include a Beauty NVQ Level 3 (NQF 5) or equivalent, as well as a good underpinning knowledge of Anatomy and Physiology (SERC, 2019).

5.3.3 Educational awareness

This involves increasing public awareness of the potential hazards and dangers that is associated with using laser hair removal devices. The main aim is to inform the public so that they can understand the importance of choosing a reputable provider, by checking if the laser hair removal operator is qualified and complies with all the safety requirements and precautions. Practical advice and safety guidance should be made available via factsheets and brochures, so that clients can be clearly informed about expectations when choosing a provider.

The guidance could give information on:

- Recommended training to perform laser hair removal training.
- Risks associated with laser hair removal procedures.
- Importance of using quality equipment (approved by Conformité Européene, CE, or Food and Drug Administration, FDA).
- Importance of client compliance.
The success of this model is dependent on effective ways to inform the public as well as placing pressure on businesses to provide safe and effective procedures. It would also require industry associations to assist in the continuous promotion of the safety guides.

5.4 Recommendations for Future Studies
As the popularity of the medical aesthetics industry increases, so does the need to regulate who is allowed to perform these aesthetic treatments and what qualification is required. Laser hair removal forms part of the medical aesthetic industry however, there are many other modalities that are performed by therapists without any need for formal training. Medical aesthetics is a combination of medical procedure performed by a medical practitioner and advanced skin/body procedure performed by skincare therapists. These treatments include collagen induction therapy such as laser skin rejuvenation, micro-needling, and radio frequency therapy, which either stimulates the skin’s functioning or produced a control injury to the skin to allow the wound healing process to bring upon a desired result.

The following future studies should be considered to further enforce the need for regulation and standardisation of aesthetic procedures performed by skincare therapists:

- To investigate the type of training provided to perform aesthetic treatments by skincare therapist.
- To investigate adverse side effects of aesthetic treatments performed by skincare therapists.
- To investigate the global standards and regulation of who can perform aesthetic treatments, and which requirements are needed.

5.5 Shortcomings
Although the response rate of the clinic owners/managers and laser hair removal operators were sufficient, a larger response was needed from tertiary institutions to establish an enhanced conclusion. The better response rate could have shed more
light on the gaps currently in education, which would increase the need for intervention.

5.6 Reflections
The current research study was beneficial as it was a national study, which included several samples with various viewpoints on the current practise and education of laser hair removal therapy. As a current educator in the private sector and a qualified Somatologist with many years of experience in the aesthetic and Health and Skincare industry, the researcher found that the study was invaluable in further guidance and preparation of students entering the industry, particularly what training is needed to perform aesthetic treatments such as laser hair removal. It is expected that the outcomes of this study will bring awareness of the lack of standardisation and regulation currently existing in industry.
REFERENCES


Online laser training (2017) *Become a certified Laser and IPL operator*. Available at: https://www.onlinelasertraining.co.uk/ [Accessed 11 January 2019]


APPENDIX A: Survey questionnaire to clinic owners/managers

THE QUALIFICATION AND TRAINING OF LASER HAIR REMOVAL OPERATORS WITHIN SOUTH AFRICA

I confirm that I have read and understand the information sheet dated July 2017 for the above study. I also understand that my participation is voluntary and I am free to withdraw from this study at any time without giving any reason by not submitting the survey, and I agree to take part in the study.

Before commencing with the survey please select (√) below

□ I have read and understand the above mentioned

Please select (√) the appropriate answer:

1) Qualified laser hair removal operators from tertiary institutions who have worked for our clinic are adequately trained to perform laser hair removal therapy.
   □ Strongly agree
   □ Agree
   □ Disagree
   □ Strongly disagree

2) They should have been more emphasis on laser training during their tertiary education of laser hair removal operators.
   □ Strongly agree
   □ Agree
   □ Disagree
   □ Strongly disagree

3) Does the clinic often have to provide additional training in laser hair removal to laser hair removal operators?
   □ Yes
   □ No
4) Who provides additional laser hair removal training that is needed?
   □ Senior laser hair removal operators
   □ Owner of clinic
   □ Laser manufacturers
   □ No additional training needed

5) How much additional training of qualified laser hair removal operators is required for them to be considered competent in laser hair removal therapy?
   □ 1-24 hours
   □ 1-3 days
   □ 4 – 7 days
   □ 1 week – 4 week
   □ More than a month
   □ They have been adequately trained
APPENDIX B: Survey questionnaire to manufacturers

THE QUALIFICATION AND TRAINING OF LASER HAIR REMOVAL OPERATORS WITHIN SOUTH AFRICA

I confirm that I have read and understand the information sheet dated July 2017 for the above study. I also understand that my participation is voluntary and I am free to withdraw from this study at any time without giving any reason by not submitting the survey and I agree to take part in the study.

Before commencing with the survey please select (√) below

I have read and understand to the above mentioned

Please select (√) the appropriate answer:

1) Indicate the duration of practical hours performed with students/ laser hair removal operator in laser hair removal therapy.
   □ Less than 30 minutes
   □ More than 30 minutes but less than an hour
   □ 1 - 5 hours
   □ 6 – 10 hours
   □ 11 – 15 hours
   □ 16 – 20 hours
   □ 21 - 25 hours
   □ More than 26 hours
   □ No practical training is provided

2) Indicate the number of case studies performed with students/ laser hair removal operators in laser hair removal therapy.
   □ 1 – 5 case studies
   □ 6-10 case studies
   □ 11 – 15 case studies
   □ 16 – 20 case studies
   □ More than 20 case studies
☐ No practical training is provided

3) Indicate the type(s) of laser hair removal device(s) used practically (Mark all applicable).
☐ Ruby laser
☐ Alexandrite laser
☐ Diode laser
☐ Nd:YAG laser
☐ Intense Pulse Light
☐ Pulse dye laser
☐ No practical training

4) Indicate the focus areas of practical training (Mark all applicable).
☐ Face
☐ Body
☐ No practical training

5) Indicate the number of hours allocated for lecturing theory in laser hair removal therapy.
☐ Less than 30 minutes
☐ More than 30 minutes but less than an hour
☐ 1 - 5 hours
☐ 6 - 10 hours
☐ 11 - 15 hours
☐ 16 - 20 hours
☐ 21 - 25 hours
☐ More than 26 hours

6) Select the theory content covered in laser hair removal sector (Mark all applicable).
☐ Laser physics
☐ Mechanism of action
☐ Comparisons with other removal techniques
☐ Radiation-tissue interaction
7) Indicate the pass mark for laser hair removal theoretical examination.

- Less than 40%
- 40%
- 45%
- 50%
- 55%
- 60%
- 65%
- 70%
- 75%
- 80% and above
- No theoretical examination

8) Indicate the pass mark for laser hair removal practical examination.

- Less than 40%
- 40%
- 45%
- 50%
- 55%
- 60%
- 65%
- 70%
- 75%
- 80% and above
No practical examination

9) What National Qualification Framework (NQF) level incorporates laser hair removal training (practical and theoretically)?

- NQF 3
- NQF 4
- NQF 5
- NQF 6
- NQF 7
- NQF 8
- NQF 9
- NQF 10
- None
APPENDIX C: Survey questionnaire to laser hair removal operators

THE QUALIFICATION AND TRAINING OF LASER HAIR REMOVAL OPERATORS WITHIN SOUTH AFRICA

I confirm that I have read and understand the information sheet dated July 2017 for the above study. I also understand that my participation is voluntary and I am free to withdraw from this study at any time without giving any reason by not submitting the survey, and I agree to take part in the study.

Before commencing with the survey please select (✓) below
□ I have read and understand the above mentioned
Please select (✓) the appropriate answer:

1) Indicate your highest qualification obtained.
□ High school diploma
□ 1 year certificate in skin care therapy
□ 2 year College level Diploma in skin care therapy
□ 3 year College level Diploma in skin care therapy
□ 3 year University Diploma in skin care therapy
□ 4 year University Bachelor Degree in skin care therapy
□ University Master’s Degree in skin care therapy

2) At what Tertiary Institution was your qualification obtained? (Mark all applicable).
□ Asante Health and Skincare
□ Beautiko College
□ Beauty Academy International
□ Beauty Dynamix Academy & Distribution
□ Beauty Specialist Training Centre
□ Beauty Therapy Institute
□ Bio-Luminesce Academy
- BN Academy
- Bronze Beauty Academy
- Camelot international health and skincare education
- Camford Hair & Beauty Academy
- Cape Nail and Beauty Academy
- Capri Beauty
- Carpe Diem
- Centurion Academy
- College of Cape Town
- Complete School Of Hairdressing, Beauty Therapy and Make Up Artistry
- Dermatech
- Elizabeths Beauty Academy
- Espoir beauty school
- Face to Face Beauty & Make-up School
- Helderberg School of Beauty
- Hydro international college
- Image and style international training academy
- International academy of health and skin care
- Isa Carstens Academy
- Janelle College
- Knowing Beauty Training Academy & Salon
- Madge Wallace Beauty Therapy College
- Northlink College
- NSI Western Cape
- Potchefstroom Akademie (Pty) Ltd
- Qualitas Career Academy
- SA Beauty Academy
- Sanguine Spa and College
- Soma Sense Academy
- Susca Watts Beauty Academy
- Total Concept Beauty & Skincare
- Tshwane North College - Pretoria Campus
- University of Johannesburg
- University of Technology
3) Who trained you in “Laser Hair Removal” therapy? (Mark all applicable).
- Senior laser hair removal operators
- Clinic Owner
- Laser manufacturer
- Self taught
- Lecturer at College or University

4) Indicate the estimated duration of theory training on Laser hair removal therapy that you received.
- Less than 30 minutes
- More than 30 minutes but less than an hour
- 1 - 5 hours
- 6 – 10 hours
- 11 – 15 hours
- 16 - 20 hours
- 21 - 25 hours
- More than 26 hours
- No theory training provided

5) Indicate the duration of the practical training hours before you were considered competent to perform laser hair removal therapy.
- Less than 30 minutes
- More than 30 minutes but less than an hour
- 1 - 5 hours
- 6 – 10 hours
- 11 – 15 hours
- 16 - 20 hours
- 21 - 25 hours
- More than 26 hours
- No practical training provided

6) Indicate the type(s) of laser hair removal device(s) you were trained in? (Mark all applicable).
□ Ruby laser
□ Alexandrite laser
□ Diode laser
□ Nd:YAG laser
□ Pulse dye laser
□ Intense Pulse Light
□ No practical training

7) Number of years’ experience performing laser hair removal therapy:
   □ Less than one year
   □ 1 - 3 years
   □ 4 - 6 years
   □ 7 - 10 years
   □ More than 11 years
   □ None

8) The amount of training on laser hair removal from your tertiary institution was sufficient.
   □ Strongly agree
   □ Agree
   □ Disagree
   □ Strongly disagree
APPENDIX D: Survey questionnaires to the main laser hair removal lecturer/Head of Department at accredited tertiary institutions

QUALIFICATION AND TRAINING OF LASER HAIR REMOVAL OPERATORS WITHIN SOUTH AFRICA

I confirm that I have read and understand the information sheet dated July 2017 for the above study. I also understand that my participation is voluntary and I am free to withdraw from this study at any time without giving any reason by not submitting the survey, and I agree to take part in the study.

Before commencing with the survey please select (√) below
□ I have read and understand the above mentioned

Please select (√) the appropriate answer:

1) Does the institution offers laser hair removal training.
□ Yes
□ No

2) Indicate the number of hours allocated for lecturing theory in laser hair removal therapy.
□ Less than 30 minutes
□ More than 30 minutes but less than an hour
□ 1 - 5 hours
□ 6 – 10 hours
□ 11 – 15 hours
□ 16 - 20 hours
□ 21 - 25 hours
□ More than 26 hours
□ No theoretical training is provided

3) Select the theory content covered in laser hair removal (Mark all applicable).
□ Laser physics
□ Mechanism of action
Comparisons with other removal techniques
Radiation-tissue interaction
Laser safety
Skin biology
Light therapy in practice
Hair biology
Legal issues
Laser parameters that affect results
Side effects and risks
Contraindications
None

4) Indicate the pass mark for laser hair removal theoretical examination.
Less than 40%
40%
45%
50%
55%
60%
65%
70%
75%
80% and above
No theoretical examination

5) Indicate the duration of practical hours performed with students in laser hair removal therapy.
Less than 30 minutes
More than 30 minutes but less than an hour
1 - 5 hours
6 – 10 hours
11 – 15 hours
16 - 20 hours
21 - 25 hours
More than 26 hours
No practical training is provided

6) Indicate the type(s) of laser hair removal device(s) used practically (Mark all applicable).
- Ruby laser
- Alexandrite laser
- Diode laser
- Nd:YAG laser
- Intense Pulse Light
- Pulse dye laser
- No practical training

7) Indicate the number of case studies performed with students in laser hair removal therapy
- 1 – 5 case studies
- 6-10 case studies
- 11 – 15 case studies
- 16 – 20 case studies
- More than 20 case studies
- No practical training is provided

8) Indicate the focus areas of practical training (Mark all applicable).
- Face
- Body
- No practical training

9) Indicate the pass mark for laser hair removal practical examination.
- Less than 40%
- 40%
- 45%
- 50%
- 55%
- 60%
10) What National Qualification Framework (NQF) level incorporates laser hair removal training (practical and theoretically)?

- NQF 3
- NQF 4
- NQF 5
- NQF 6
- NQF 7
- NQF 8
- NQF 9
- NQF 10
- No laser hair removal training is provided

11) The industry should have standard requirements in terms of minimum practical and theoretical hours with regards to laser hair removal therapy.

- Strongly agree
- Agree
- Neither agree, nor disagree
- Disagree
- Strongly disagree

12) The regulation of laser hair removal services by an established Regulatory Board would help to create unified standards that applies to all laser hair removal operators.

- Strongly agree
- Agree
- Neither agree, nor disagree
- Disagree
- Strongly disagree
My name is Mandy Thomas and I am currently completing my Master's Degree in Somatology at the University of Johannesburg. I would like to invite you to participate in a research study on the qualification and training of laser hair removal operators within South Africa.

Before you decide on whether to participate, I would like to explain to you why the research is being done and what it will involve for you. The study is part of a research project being completed as a requirement for a Master's Degree in Somatology through the University of Johannesburg.

The purpose of the study is to investigate the qualifications and training in laser hair removal therapy in South Africa to establish perceptions about whether graduates are indeed proficient regarding laser hair removal services upon graduating.

Below, I have compiled a set of questions and answers that I believe will assist you in understanding the relevant details of participation in this research study. Please read through these. If you have any further questions I will be happy to answer them for you, my contact details are listed at the end.
DO I HAVE TO TAKE PART? No, you don’t have to. It is up to you to decide to participate in the study.

WHAT EXACTLY WILL I BE EXPECTED TO DO IF I AGREE TO PARTICIPATE? If you agree to participate in the study you will be required to complete an electronic survey with 5-12 multiple choice questions. It will only take about 5-12 minutes of your time.

WHAT WILL HAPPEN IF I WANT TO WITHDRAW FROM THE STUDY? Once you have completed and sent the survey back you are unable to withdraw from the study. The reason for this is that the researcher will be sent the results anonymously and will not be able to identify your survey. However, you may withdraw your consent from the study, without giving a reason and without prejudice, before completing and sending the survey back to the researcher.

IF I CHOOSE TO PARTICIPATE, WILL THERE BE ANY EXPENSES FOR ME, OR PAYMENT DUE TO ME: You will not be paid to participate in this study and you will not bear and expenses.

RISKS INVOLVED IN PARTICIPATION: There are no risks associated with participation in this study.

BENEFITS INVOLVED IN PARTICIPATION: There are no direct benefits to you.

WILL MY TAKING PART IN THIS STUDY BE ANONYMOUS? The survey collects no identifying information of any respondent. All of the response in the survey will be recorded anonymously. As a result, it will not be possible for me or anyone else to identify your responses once these have been submitted.

WHAT WILL HAPPEN TO THE RESULTS OF THE RESEARCH STUDY? The results will be written into a research report that will be assessed. In some cases, results may also be published in a scientific journal. In either case, you will not be identifiable in any documents, reports or publications. You will be given access to the study results if you would like to see them, by contacting me.
WHO IS ORGANISING AND FUNDING THE STUDY? The study is being organised by me, under the guidance of my research supervisor at the Laser Research Centre, Faculty of Health Sciences in the University of Johannesburg. The study has not received any funding.

WHO HAS REVIEWED AND APPROVED THIS STUDY? Before this study was allowed to start, it was reviewed in order to protect your interests. This review was done first by the Department of Somatology, secondly by the Faculty of Health Sciences Higher Degrees Committee and then thirdly by the Faculty of Health Sciences Research Ethics Committee at the University of Johannesburg. In all cases, the study was approved.

WHAT IF THERE IS A PROBLEM? If you have any concerns or complaints about this research study, its procedures or risks and benefits, you should ask me. You should contact me at any time if you feel you have any concerns about being a part of this study. My contact details are:

Mandy Thomas
0729198754
manmas25@gmail.com

You may also contact my research supervisor:
Dr Nicolette Houreld
nhoureld@uj.ac.za

If you feel that any questions or complaints regarding your participation in this study have not been dealt with adequately, you may contact the Chairperson of the Faculty of Health Sciences Research Ethics Committee at the University of Johannesburg:

Prof. Marie Poggenpoel
Tel: 011 559-6686
Email: mariep@uj.ac.za
By completing and submitting the survey, you are indicating your consent to participate in the study. Please click on the survey link below and provide feedback no later than 31 July 2017

https://www.surveymonkey.com/s/

Your participation in this study will be greatly appreciated.

Regards

Mandy Thomas
APPENDIX F: Research Ethics Committee Approval

UNIVERSITY JOHANNESBURG

FACULTY OF HEALTH SCIENCES

RESEARCH ETHICS COMMITTEE
NHREC Registration no: REC-241112-035

REC-01-138-2016
27 September 2016

TO WHOM IT MAY CONCERN:

STUDENT: THOMAS, M
STUDENT NUMBER: 216046200

TITLE OF RESEARCH PROJECT: The Qualification and Regulation of Laser Hair Removal Operators within South Africa

DEPARTMENT OR PROGRAMME: SOHATOLGY
SUPERVISOR: Dr N Hourieid
CO-SUPERVISOR: Dr N Brooks

The Faculty Academic Ethics Committee has scrutinised your research proposal and confirm that it complies with the approved ethical standards of the Faculty of Health Sciences; University of Johannesburg.

The REC would like to extend their best wishes to you with your postgraduate studies.

Yours sincerely,

[Signature]

Prof M Poggenpoel
Chair: Faculty of Health Sciences REC
Tel: 011 559 6689
Email: mrobin@uj.ac.za
APPENDIX G: STATKON letter

To : The Research and Ethics Committee  
The Faculty of Health Science

From : Ms Juliana Van Staden  
STATKON

Date : 15th July 2016

RE : RECOMMENDATION FOR A MASTERS RESEARCH STUDY IN SOMATOLOGY BY MANDY THOMAS

This serves to confirm that Ms Mandy Thomas came to visit STATKON Offices for the appointment dated the 12th July 2016. The purpose was to give proper guidance and recommendations for the progress of her Masters research work, mainly to assess the research design, instruments and appropriate data analysis methodology. This was done under the supervision of Dr Nicolette Hurel.

The propose topic is: The qualification and regulation of laser hair removal operators within South Africa. Valuable discussions and inputs were given on that day and both parties agreed to follow recommendations made.

For more information feel free to contact our offices at 011 559 2703.

Thank you.

Ms Juliana Van Staden  
STATKON Offices