

Full Length Research Paper

Emerging trends in the profession of Biokinetics: A 10 year perspective (2007-2017)

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The consistent review of developing patterns in any healthcare profession is important, as this allows the determination of whether the current practitioner registry meets the healthcare demands, or whether the patient market has become oversaturated with practitioners. The South African Biokinetics profession has been established for 35 years, but as never undergone an examination of its developing trends. The aim was to determine the emerging trends of the HPCSA registered students-in-training, intern-biokineticists, and practitioners. Additionally to ascertain whether the practicing biokinetic registry is equitable to the potential South African private healthcare demand. The HPCSA Annual Reports of 2012/2013 and 2016/2017 identified the number of students-in-training, intern-biokineticists and biokineticists. CMS reports of 2013-2015 identified the South African NCDs and HIV/AIDS prevalence. Annual students-in-training, intern-biokineticists, and practitioner registrations are growing at average of 4.6, 43.5 and 6.5% per year. However, the conversion of intern-biokineticists to practitioners is progressively dwindling, nevertheless, this attrition of intern-biokineticists is not significant ($p>0.05$). Positive growth in students-in-training, intern-biokineticists and practitioners HPCSA registrations were identified. The number of practicing biokineticists in the South African private healthcare sector is reaching saturation point relating to the rehabilitation of NCDs and HIV/AIDS patients.

Key words: Intern-biokineticist, attrition and growth.

INTRODUCTION

The profession of Biokinetics promulgates the philosophy of *exercise is medicine*, which is founded on the salutogenic benefits of exercise and human movement (Strydom, 2005). A biokineticist is a final-phase exercise therapist who rehabilitates orthopaedic and non-communicable diseases (NCDs) in the post-medical

and/or final phase of the pathogenic healthcare dimension (Strydom, 2005). Biokineticists are also strongly involved in health and wellness promotion campaigns within the salutogenic health paradigm as a preventive measure against development of NCDs, fighting to ensure continuing and improved quality of life for patients

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(Strydom, 2005). The scope of the profession also allows practitioners to be involved in health and wellness campaigns aimed at arresting the development of a sedentary lifestyle, NCDs, and the consequent reduction in patients' quality of life (HPCSA, 2017). South African healthcare legislation permits biokineticists to practice in the private healthcare sector and in selected public sector such as the South African Defence Force (HPCSA, 2017). Presently biokineticists are not employed by the South African Health Department in order to manage patients in public hospitals, clinics, or schools (Strydom, 2005). However, the South African biokinetic profession has admirable exercise therapeutic expertise to help manage the NCDs and HIV/AIDS epidemic, similar to the clinical skill set of the American College of Medicine clinical exercise physiologist (Evans et al., 2016; Ellapen et al., 2017). Australia, Europe and United States of America have embraced a multi-disciplinary strategic approach to combat the global NCDs and HIV/AIDS epidemic, which has enlisted the service of exercise therapists such as clinical exercise therapists (Arena et al., 2015). Exercise therapists have been identified auxiliary medical personnel that are instrumental in managing various NCDs and HIV/AIDS patients through exercise and structured physical activity rehabilitation programmes (Dishman et al., 2012). Regular structured rehabilitative exercise and physical activity has empirically demonstrated its value to enhance quality of life and longevity of the aforementioned patients (Dishman et al., 2012). The South African chapter of this global exercise therapy campaign to manage the NCDs and HIV/AIDS epidemic enlists the services of the South African exercise therapist, known as a biokineticist (Evans et al., 2016; Moss and Lubbe, 2011).

To better understand the impact of the aforementioned developing trends regarding biokinetic students-in-training and intern-biokineticists on the global growth of the profession, one needs to be briefly oriented with the education and training of Biokinetic graduates in South Africa. This background information will explain what it means to be a biokinetic student-in-training, an intern biokineticist and a practicing biokineticist, underlining their progression within the profession. Originally Biokinetics education and training entailed a three-year graduate credential in Human Movement Science or Human Kinetics and Ergonomics, which was followed by a post-graduate degree specialisation in Biokinetics, commonly referred to as the 3+1 model (Ellapen et al., 2017). During the postgraduate year of tuition (4th year), students commenced their mandatory two years of professional clinical internship (Nel, 2014). At this time, the incumbent student is required to register with the Health Professions Council of South Africa (HPCSA) and Biokinetics Association of South Africa (BASA) as a student biokineticist-in-training. After the academic completion of their post-graduate tuition, the student gains eligibility to begin their second year of clinical

internship (5th year), and is afforded the opportunity to register as an intern-biokineticist with BASA and the HPCSA (BASA, 2018). The second year of clinical internship necessitates that the intern-biokineticist secures a clinical internship at a private biokinetic practice and/or at one of the biokinetics training institutions that are accredited by BASA and the HPCSA. There are 12 South African tertiary institutions that provide education and training, seven continue to offer the 3+1 model, while the other five institutions follow the new professional degree (Ellapen et al., 2017). The academic content of both degrees are similar, however in the new professional degree students start their clinical internship earlier (Ellapen et al., 2017). Students enrolling for the new professional Biokinetics credential need to register with BASA and HPCSA as a student-in-training from their first year of tuition (BASA, 2018).

Regular monitoring of emerging trends within a healthcare profession is important in order to determine whether the present quota of practitioners meets the healthcare needs, or whether the patient market has become saturated with too many practitioners, leading to the inevitable attrition of practitioners from the profession. Moss and Lubbe (2011) is the only study that has reviewed whether the number of practicing biokineticists meets the required private healthcare demand, but they did not consider the developing trends within the profession. As such there is a paucity of literature discussing both emerging trends and the attrition of the profession of Biokinetics.

Moss and Lubbe (2011) reported that there is an insufficient number of biokineticists practicing in the South African private health care sector given the high prevalence of biokinetic rehabilitative NCDs. Non-communicable diseases are chronic non-infectious diseases and may include cardiovascular and chronic respiratory diseases, as well as cancer and diabetes mellitus (Evans et al., 2016). Moss and Lubbe (2011) and Evans et al. (2016) confirmed that the aforementioned diseases can be rehabilitated by biokineticists. Based on 2007 statistics for the pharmaceutical treatment of NCDs, Moss and Lubbe (2011) recommended that 7472 biokineticists were needed within the South African private healthcare sector. This was calculated by employing a regression statistical calculation, which took the population demographics of biokinetic rehabilitative NCDs into account and can be equated to one biokineticist rehabilitating 100 NCD patients per month. The 2007 South African populace was estimated at 48 287 324 and in the context of our study this statistic can be further broken down into public and private healthcare dependants. The South Africa Health System Trust (HST) report revealed that 40 809 284 citizens were dependant on public healthcare, whilst approximately eight million citizens were made use of private healthcare due their personal financial status (HST, 2017). Within the group of approximately eight million citizens who

choose to use private healthcare, 747 199 people were identified with biokineticist rehabilitative NCDs (Moss and Lubbe, 2011). No subsequently follow-up study has been undertaken in order to determine whether the present number of biokineticists practicing within the South African private healthcare sector meets the pathogenic demand identified by Moss and Lubbe (2011). The primary and novel aim of the current study is to identify the emerging trends relating to biokinetic students-in-training and intern-biokineticists, as well as the registration of intern-biokineticists as practicing biokineticists, ultimately seeking to determine whether the profession is currently suffering from an attrition of practitioners. A secondary aim is to ascertain whether the present number of biokineticists practicing in the South African private healthcare sector meets its demand.

MATERIALS AND METHODS

The nature of this study was descriptive and observational in design. The authors consulted literature within the public domain, thereby not requiring ethical approval as per National Research Guidelines. Figure 1 provides a graphical display of the data collection and review processes. The HPCSA Annual Reports of 2012/2013 and 2016/2017 were reviewed so as to determine number of students-in-training, inter-biokineticists and practitioners within the profession of Biokinetics. Strydom (2005) have highlighted that it is illegal for biokineticist in South Africa to practise without HPCSA registration, and therefore only registered biokineticists were taken into consideration. The HPCSA Annual Reports provided statistics regarding the number of biokineticists and student-in-training registrations from 2007 to 2017 as well as intern-biokineticist registrations from 2012 to 2017 (HPCSA, 2013, 2017) (Figure 1). The South African HST was consulted in order to determine population demographics (HST, 2008, 2014). The South African Council of Medical Schemes (CMS) was consulted so as to identify the prevalence of biokinetic rehabilitative NCDs and HIV/AIDS (CMS, 2013, 2014, 2015, 2017) (Figure 1). Furthermore, only the private healthcare sector prevalence of NCDs and HIV/AIDS were identified, as per South African healthcare legislation pertaining to the profession of Biokinetics. It is important to note that the profession of Biokinetics exceeds the simple rehabilitation of NCDs, and includes the rehabilitation of orthopaedic injuries, as well as health and wellness campaigns, physical activity and performance enhancement (Ellapen et al., 2017). As such, the rehabilitation of HIV/AIDS falls within the scope of the profession of biokineticists and has therefore also been included in the private healthcare patient market. Due to the difficulty of ascertaining the statistics concerning the biokinetic rehabilitation of orthopaedic injuries within the South African private healthcare sector, this study has only focused on the growth rate of the profession of Biokinetics and the subsequent rehabilitation of NCDs and HIV/AIDS patients.

Descriptive (mean, standard deviation, percentages and frequencies) and inferential statistics (independent two-tail student t-test) were employed in the data analysis. Probability was set at $p < 0.05$.

RESULTS

The results reviewed the developing trends of biokinetic students-in-training, intern-biokineticists and practicing

biokineticists (Table 1). The statistics concerning students-in-training reflected student enrolment among the 12 tertiary training institutions. The steady increase in student registration from 2010 to 2017, illustrates the growth of the profession at the academic level. The number of intern-biokineticists has also grown by an average of 43.5% over the period from 2013 to 2017. The annual registration of practicing biokineticists reveals a positive average growth rate of 6.5% over the last 10 years (2007-2017) (Table 1). The optimal growth rate of the profession was derived from the total number intern-biokineticists registered in a specific year and their subsequent registration as practicing biokineticists the following year (Table 2). The HPCSA Annual Reports only provide statistics from 2012 to 2017, the authors were therefore only able to analyse the data over a five year period (2013-2017) (Table 2). During 2012 and 2013 the number of intern-biokineticists registered with HPCSA was less than the number of inter-biokineticists who registered as practicing biokineticist during the following year (2013 and 2014 respectively) thereby indicating positive growth (Table 2). However, during years from 2015 to 2017 the number of intern-biokineticists registered with HPCSA were progressively greater than the number of intern-biokineticists that registered as practicing biokineticists the following year, thereby highlighting the attrition of intern-biokineticists from the profession (Table 2). The authors completed an independent two tail t-test that indicated that the attrition of intern-biokineticists with regards to practicing biokineticists was non-significant ($p > 0.05$) (Table 3). A comparative review of NCDs and HIV/AIDS in 2007 and in 2011 (Tables 4 and 5) shows a significant upsurge in their prevalence ($p < 0.05$). The 2011 statistics were used because they show the statistics for the same NCDs as of 2007; moreover, the 2017 statistics are unavailable at time of writing.

DISCUSSION

The discussion will be presented as follows: emerging trends regarding biokinetic students-in-training, intern-biokineticists, and practicing biokineticists. This will be followed by a review of the registration of intern-biokineticists as practicing biokineticists, highlighting their attrition. Finally the question of whether the number of practicing biokineticists in 2011 were equitable to manage the South African private healthcare sector's NCDs and HIV/AIDS epidemic will be reviewed.

Students-in-training growth

The registration numbers of biokinetic students-in-training have increased by an average of 4.6% from 2007 to 2017. These statistics are encouraging and they exemplify the continued interest of the South African society with the profession. The growth in the number of students-in-

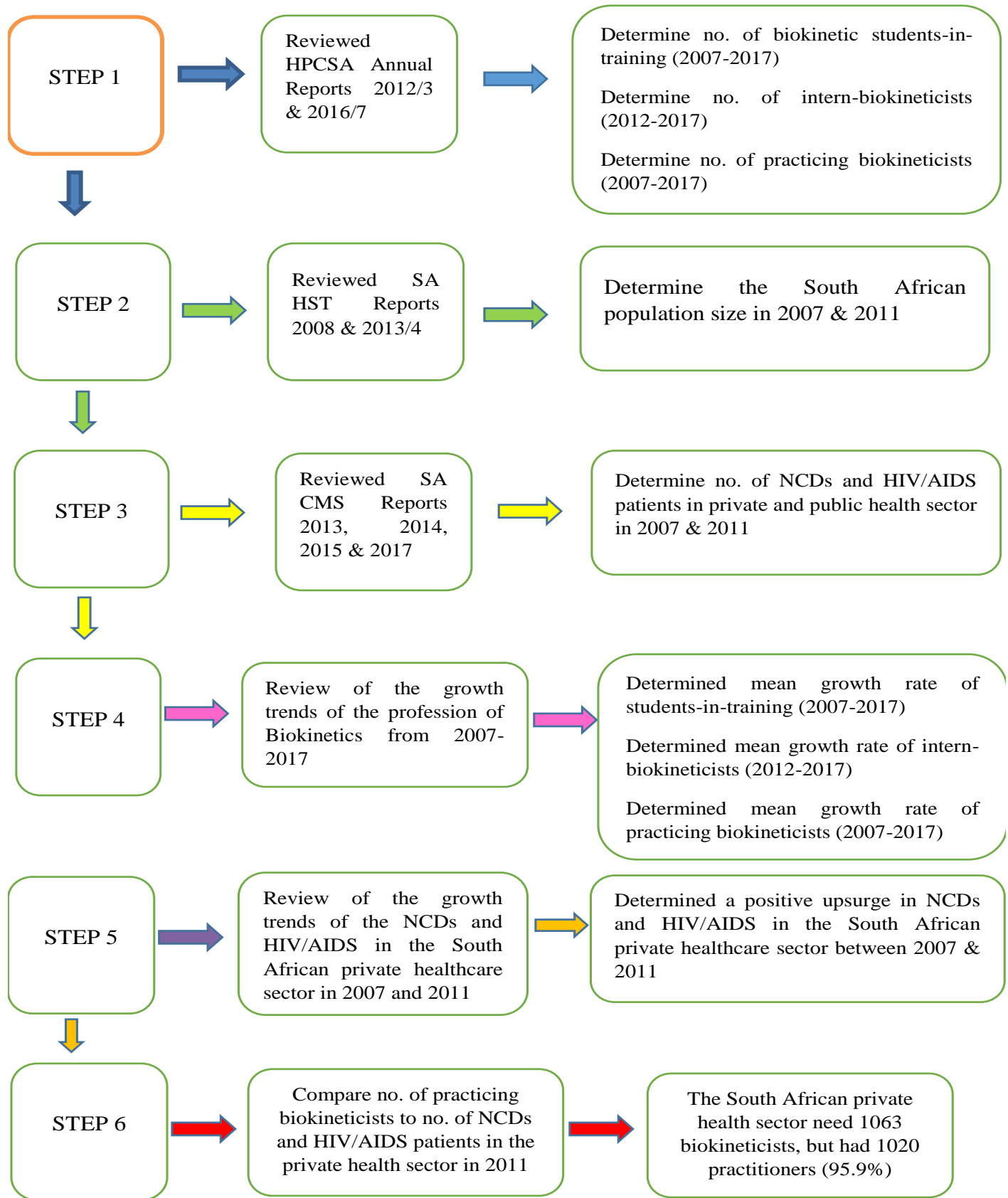


Figure 1. Graphic display of the data gathering and reviewing processes.

Table 1. Growth rate of biokinetic students, interns and practitioners from 2007 to 2017.

Year	Biokinetic students-in-training (% growth rate)	Intern-biokineticists (% growth rate)	Practicing biokineticists (% growth rate)
2007	399	not available	823
2008	364 (-9.6%)	not available	844 (2.4%)
2009	344 (-5.8%)	not available	902 (6.4%)
2010	475 (+27.5%)	not available	959 (5.9%)
2011	481 (+1.2%)	not available	1020 (5.9%)
2012	531 (+9.4%)	34	1099 (7.1%)
2013	516 (-2.9%)	85 (60%)	1191 (7.7%)
2014	529 (+2.4%)	265 (67.9%)	1305 (8.7%)
2015	566 (+6.5%)	410 (35.3%)	1384 (5.7%)
2015	635 (+10.8%)	595 (31.0%)	1505 (8.0%)
2017	684 (+7.1%)	777 (23.4%)	1618 (6.9%)
Mean (SD) (%)	502.1 (\pm 106) (+4.6%)	361 (\pm 290) (+43.5%)	1150 (\pm 272.6) (6.5%)

Table 2. Variation rate of the transition of intern-biokineticists to practicing biokineticists (2012-2017).

Year	Intern-biokineticists registered with HPCSA	Practicing biokineticists registered with HPCSA	Number of intern-biokineticists registered as practicing biokineticists as HPCSA records (Present year biokineticists –previous year intern-biokineticists)	Variation in the number of intern-biokineticists who either did or not register as practicing biokineticists the next year
2012	34	1099	not available	not available
2013	85	1191	92	+58** (+63.0%)
2014	265	1305	114	+29** (+25.4%)
2015	410	1384	79	-186** (-235.4%)
2016	595	1505	121	-289** (-238.8%)
2017	777	1618	113	-482** (-426.5%)

Table 3. Comparative difference between intern-biokineticists registered with HPCSA and the actual biokineticists registered the following years (2012-2017).

Number of intern-biokineticists registered with HPCSA	Number of intern-biokineticists registered as practicing biokineticist in the following year	p-value
103.8 (\pm 17.5)	277.8 (\pm 231.7)	0.066

training is directly associated with the education and training component of the profession that falls under the preview of the 12 South African tertiary institutions, indirectly suggesting that students are satisfied with their education and training. However, a more direct analysis of the perceptions that biokinetics students-in-training have concerning the quality of their education and training should be undertaken. Despite this, it must be noted that the 4.6% growth in the number of biokinetic students-in-training is far below the international exercise therapy student enrolment growth rate of 35% (Rivers

et al., 2015).

Intern-biokineticists growth

The progression of students from students-in-training into intern-biokineticists is marked by an average positive growth of 43.5% (from 2013 to 2017). This is suggestive of the fact that students are keen to gain credentials and these statistics furthermore reflect the work integrated learning stage of the clinical internship of a biokineticist,

Table 4. The prevalence of exercise rehabilitative diseases in the South African private healthcare sector in 2007 and 2011.

NCDs	2007	2011	Percent growth of NCDs & HIV/AIDS (2011 stats – 2007 stats)/2007 stats x 100
Addison's disease	60	60	0
Asthma	13040	15360	+17.8
Bronchiectasis	100	100	0
Bipolar mood disorder	1000	2380	+138
Cardiac failure and cardiac myopathy	2650	4140	+56.2
Chronic obstructed pulmonary disease	1600	1300	-18.7
Chronic renal disease	200	300	+50
Crohn's disease	200	150	-25
Diabetes insipidus	20	20	0
Diabetes Type 1	2800	2600	-7.1
Diabetes Type 2	14400	23300	+61.8
Dysrhythmia	2820	3430	+21.6
Epilepsy	3480	4130	+18.6
Glaucoma	2100	2700	+28.5
Haemophilia	20	20	0
Hyperlipidaemia	30220	34430	+13.9
Hypertension	60980	82560	+35.8
Hypothyroidism	10990	14280	+29.9
Multiple sclerosis	100	100	0
Parkinson's disease	700	800	+14.2
Rheumatoid arthritis	2000	2600	+30
Schizophrenia	300	500	+66.6
Systemic lupus erythematosus	200	220	+10
Ulcerative colitis	400	300	-25
HIV/AIDS	4940	9380	+89.8
Sum	161760	212 460	+31.3

Table 5. Comparative difference between the prevalence of exercise rehabilitative NCDs and HIV/AIDS in 2007 and 2011 in the South African private healthcare sector.

Total of prevalence of NCDs in 2007	Total of prevalence of NCDs in 2011	p-value
161760 (\pm 13018.8)	212 460 (\pm 17297.7)	0.01

which falls under the preview of both academic training institutions and private practitioners. This is a unique stage of clinical training, unlike the other South African exercise therapy profession of Physiotherapy (HPCSA, 2017).

Biokinetic practitioners' growth

The growth in the profession of Biokinetics can be determined by the subsequent yearly variation in number of registered practicing biokineticists with the HPCSA. This statistic shows a gradual annual growth of an average of 6.5%, comparable to that of Physiotherapy (3.8%), which is another South Africa auxiliary medical

exercise therapy profession registered with the HPCSA (HPCSA, 2017). Despite this, the degree to which intern-biokineticists subsequently register as practicing professionals can be seen to fluctuate. The number of intern-biokineticists who continue with the profession of Biokinetics has steadily decreased from 2015 to 2017, reflecting a concern in the long term growth of the profession. It is recommended that an investigation be conducted in order to determine why intern-biokineticists are no longer registering as practicing biokineticists. While attrition is largely described as the departure of an employee from their employment due to premature voluntary resignation of service, death, illness, superannuation and/or emigration (Lopes et al., 2017), in this scenario, the attrition of intern-biokineticists can be

described as the departure of graduate healthcare practitioners from the profession of Biokinetics due to voluntary non-registration. Several factors predispose attrition within the healthcare sector, including poor salaries and/or employment financial benefits, limited opportunities for professional development and mentorship, overworked, a lack of personal job satisfaction and a hostile work environment (Rakgokong, 2007; MacKusick and Minick, 2010). Ellapen et al. (2017) have reported that the alleged accusation of biokineticists trespassing upon the scope of profession of Physiotherapy has encouraged many biokineticists to leave the profession. Moss and Lubbe (2011) have furthermore reported that many biokineticists leave the profession in order to seek employment as pharmaceutical sale consultants due on one hand to the limited patient market, and on the other hand to the substantially more lucrative salary packages of pharmaceutical sale consultants. The attrition of healthcare professionals prevents the healthcare system from satisfying the needs of the populace, thus adversely influencing society's health and wellbeing (Lopes et al., 2017). To date there is no literature which identifies the attrition of South African biokineticists from the profession, a fact which has encouraged the drafting of this novel communication. It is recommended that investigations be conducted so as to determine the predisposing factors which are contributing to the attrition of intern-biokineticists from the profession.

Does the number of practicing biokineticists meet the demands of the patient market?

The South African population has grown exponentially, increasing from 48 million in 2007 to 51 million in 2011 (HST, 2008, 2014). Accompanying this increase in the South African populace is an upsurge of NCDs and of HIV/AIDS (HST, 2017). Of the 51 770 560 South African citizens, HST estimates that 43 053 190 are dependent on public healthcare, while 8 717 370 citizens can afford private healthcare (HST, 2017). Now, in order to understand the market for practicing biokineticists in the South African private healthcare sector it is important to understand the concept of potential market demand. Potential market demand is considered to be the total number of patients and/or customers for whom rehabilitation may be pertinent, or who are interested in rehabilitation services (Woods, 2004). This potential market is influenced by the following customer factors; (i) customers/patients ability to afford the service/rehabilitation, (ii) the applicability of the service/rehabilitation to the customer/patient, (iii) the inaccessibility of the service/rehabilitation, (iv) ignorance regarding the availability of the service/rehabilitation, (v) customers/patient disinterest in the service/rehabilitation and (vi) customers/patients who actually seek the service

or rehabilitation rendered (Moss and Lubbe, 2011). Roger (2000) reported that the potential market refers to the maximum number of customers/patients who may buy/seek the product/service/rehabilitation, but not the actual number who will realistically purchase the service.

In 2011 it was estimated that 212 460 patients were identified as suffering from either NCDs and/or HIV/AIDS in the private healthcare sector (CMS, 2017). Adopting Moss and Lubbe's (2011) regression calculation, the South African private healthcare sector potential market demand is 2125 exercise therapists (one exercise therapist being required in order to rehabilitate 100 NCDs patients per month). However, one needs to be mindful of the fact that the profession of Biokinetics is only one of the two exercise therapy professions that are capable of rehabilitating NCDs in the South African private healthcare sector (the other being Physiotherapy). It would therefore be wise to estimate that only 50% of the South African private healthcare patient market may seek biokinetic rehabilitation. The other 50% of the potential patient market may seek physiotherapy, they may be unable to afford rehabilitation, be ignorant of the rehabilitation available and/or be disinterested in rehabilitation (taking consumer factors into account) (Moss and Lubbe, 2011). Taking the aforementioned six consumer factors that influence the potential market demand into consideration, a more realistic potential market demand for biokineticists would be 1063 practitioners. In so far as in 2011, 1020 practicing biokineticists were registered with the HPCSA, we can see that this constitutes 95.9% of estimated 1063 practitioners needed (HPCSA, 2017). These statistics suggest that the market demand for biokineticists for NCDs and HIV/AIDS rehabilitation has almost reached a saturation point. The probability over-saturation of biokineticists in the private healthcare and biokinetic tertiary training institutions should be cognizant of the aforementioned statistics and of the subsequent threat of market over-saturation, as this would ultimately limit student enrolment due to deteriorating career prospects. Despite this one needs to be mindful that the rehabilitation of NCDs and of HIV/AIDS is merely one element of the scope of profession of Biokinetics, which also includes final-phase rehabilitation of orthopaedic injuries, health and wellness programmes, human performance enhancement in the work environment and in the sports arena. It is postulated that surplus biokineticists satisfy the above mentioned needs beyond the rehabilitation of NCDs and of HIV/AIDS. Nevertheless, BASA needs to expedite the process by which biokineticists will become eligible for work in the public healthcare sector as recommended by Evans et al. (2016). The successful rehabilitation of the profession of Biokinetics of NCDs and HIV/AIDS in the private healthcare can serve as evidence that the profession will be of great value within the public healthcare sector. It can furthermore be postulated that the near saturation of

demand for biokineticists in the South African private healthcare sector has influenced the attrition of intern-biokineticists away from the profession. A vigorous investigation should be conducted so as to determine the underlying reasons for intern-biokineticist attrition.

Conclusion

The number of practicing biokineticists in South Africa is progressively growing, accompanied by both student-in-training and intern-biokineticists demographics. Despite this a recent attrition of intern-biokineticists from the professions (2015 to 2017) can be noted. An investigation identifying the reasons for this attrition should be undertaken in order to determine the predisposing factors influencing their decision. The growth in the number of biokineticists together with the upsurge in the prevalence of NCDs seems to be equitable as per 2011 statistics. However, a new threat of oversaturation of biokineticists in the South African private healthcare sector seems inevitable. It is strongly advised that BASA and the various South African biokinetic training institutions take note of these emerging trends.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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