REVIEW

Medical Radiation: Status and Availability in The Bahamas

J Isaacs, M Voutchkov, B Brevitt

ABSTRACT

Introduction: *The Bahamas became a member state of the International Atomic Energy Agency (IAEA) on January 7, 2014 (1). The purpose of this paper is to inform the reader on The Bahamas' ability to provide services that utilize radiation.*

Method: *A study was conducted on various clinics across The Bahamas, New Providence in particular (primary sample area), Grand Bahama, Abaco and Exuma. Twenty per cent of the staff members of the respective locations were given questionnaires and the chief personnel were interviewed. Staff members were advised that their responses would remain anonymous and were welcomed to participate, thereafter. Microsoft Excel was used for data input and processing. Original surveys were checked against the dataset for potential errors.*

Results: *Thirty-one clinics were approached to participate in the survey, of which 25 participated resulting in an 81% response rate. Fifty questionnaires were completed in total. Two clinics had multiple locations; therefore, 27 clinics (23 private, 4 public) participated in total. The included map illustrates the sample area of the survey, with New Providence being the primary sample area. The number of modalities, patients treated and frequency of quality assurance checks were also evaluated.*

Conclusion: *Most of the examined clinics outsourced technicians and physicists to perform quality checks. This suggests that there is a need for qualified local technical support. Further studies are needed to understand the full extent of the country's needs regarding medical radiation and figuring out the steps necessary for approaching this subject.*

Keywords: Medical Radiation, health service needs and demands, The Bahamas, staffing, quality assurance

Radiación Médica: Estatus y Disponibilidad en las Bahamas

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RESUMEN

Introducción: *Las Bahamas se convirtieron en un Estado Miembro de la Agencia Internacional de Energía Atómica (AIEA) el 7 de enero de 2014 (1). El propósito de este trabajo es informar al lector sobre la capacidad de las Bahamas para prestar servicios que utilizan radiación.*

Método: *Se realizó un estudio en varias clínicas a través de las Bahamas, Nueva Providencia en particular (área de muestra primaria), Gran Bahama, Abaco y Exuma. El veinte por ciento de los miembros del personal de las respectivas locaciones recibieron cuestionarios y el personal dirigente fueron entrevistados. A los miembros del personal se les informó que*

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DOI: 10.7727/wimj.2018.179

sus respuestas permanecerían anónimas, y se les dio la bienvenida por su participación. Para la entrada y el procesamiento de datos se usó Microsoft Excel. Las encuestas originales se chequearon contra el conjunto de datos para a fin de detectar posibles errores.

Resultados: *Treinta y una clínicas fueron abordadas para participar en la encuesta, de las cuales 25 participaron, para una tasa de respuesta de 81%. En total se completaron 50 cuestionarios. Dos clínicas tenían múltiples localidades. Por lo tanto, 27 clínicas (23 privadas, 4 públicas) participaron en total. El mapa incluido ilustra el área de la muestra de la encuesta, en la que Nueva Providencia es el área de la muestra primaria. El número de modalidades, los pacientes tratados, y la frecuencia de los controles de garantía de calidad, también fueron evaluados.*

Conclusión: *La mayor parte de las clínicas examinadas subcontrataron técnicos y físicos para realizar chequeos de la calidad. Esto sugiere que hay necesidad de apoyo técnico local calificado. Se necesitan estudios adicionales para entender el alcance completo de las necesidades del país en relación con la radiación médica y los pasos necesarios para abordar este asunto.*

Palabras clave: Radiación médica, necesidades y demandas del servicio de salud, Las Bahamas, dotación de personal, control de la calidad

West Indian Med J 2018; 67 (5): 494

INTRODUCTION

The Bahamas has a variety of medical clinics which utilize machines that emit both ionising and non-ionising radiation for diagnostic and therapeutic purposes. The country has kept both its technology and the accompanying regulations up-to-date. Though agreements were made between the International Atomic Energy Agency (IAEA) and The Bahamas in 1997, the country did not become a member until January 7, 2014 (1). The government has since implemented new legislation, such as the Ionising Radiations (Worker's Protection) Act and the Hospitals and Healthcare Clinics Regulations Act (2, 3). There is, however, room for improvement. Currently, the frequency of servicing and quality checks is not regulated, and in this regard, a lack of quality assurance can increase radiation risks to patients, staff and the general public. Subsequently, this lowers diagnostic accuracy (4), proposing risk for any medical procedure. Radiation is used in a wide range of medical applications, including disease diagnosis and treatment.

Thus, there is a need for proper staffing and support to ensure that patients receive quality service without excessive exposure to radiation. Another area of concern is the availability of radiation technology throughout the country, which may affect the consistency of service quality from staff members, as well as, posing the issue of offering a service and being overwhelmed by the demand. Additionally, the aforementioned variables form the basis of this small-scale study, which is intended to inform the reader of the ability of The Bahamas to provide radiation therapy, treatment and diagnosis. Though acceptable for local consideration, a more extensive study would be necessary for the future, to extend the country's reach, *ie* involvement in international relations.

SUBJECTS AND METHOD

The study was conducted in various clinics across The Bahamas, with particular focus in: New Providence (primary sample area), Grand Bahama, Abaco and Exuma. Questionnaires were employed as the primary tool for data collection and interviews served as a secondary source. Both the questionnaires and the interviews consisted of open-ended and closed-ended questions. Data were collected between November 2017 and March 2018. Thirty-one clinics, both publicly and privately owned, were approached for interviews and questionnaire distribution, of which twenty-five accepted. Twenty per cent of staff members were given questionnaires directly, through random sampling and were given a window of time for completion. For the New Providence clinics, the questionnaires and interviews were administered in person, meanwhile, for the out-island clinics, questionnaires and interviews were administered *via* email or telephone. Volunteers were advised that their responses would remain anonymous and were welcomed to participate, thereafter. Surveyed participants included radiologist, radiographers,

physicist and support staff, while the respective chief personnel answered the interview questions. Data from each clinic were then recorded using a unique identifier. A combination of questionnaires and managerial interviews were used to collect contrasting data. Dates were noted in the day/month/year format, with an asterisk indicating any missing data. Data were analysed in Microsoft Excel. Here analysis was carried out using the "COUNTIF" function.

RESULTS

There was an 81% response rate for clinics which were drafted in the cohort and those who actively participated in the study. Fifty questionnaires were completed by staff members, two of which indicated they were part-time employees. Approximately 70% of the participants were females, within the 31–40-year age range. Of the 27 clinics surveyed, 23 were privately owned. The map in Fig. 1 illustrates the sample area of New Providence; the red and blue markers were used to identify the private and public sectors, respectively.

Figure 2, which details the private and public clinics for each respective sample area, shows New Providence, the primary sample area, having the highest number of radiation treatment clinics with 17 (15 private, two public) in total. Abaco followed with six (five private, one public) clinics, Grand Bahama with three (two private, one public) and lastly, Exuma had one (private) clinic.

Figure 3 portrays the average number of radiation treatment patients, per workday, falling below twenty (52% of participating clinics). Subsequent figures expressed the following quantities: 22% of clinics served greater than 50 patients; 19% had 21–30 patients; 4% of the clinics each served 31–40 and 41–50 patients.

Figure 4 illustrates the number of public and private clinics, respectively, which offer diagnostic and therapeutic services of various modalities. The study

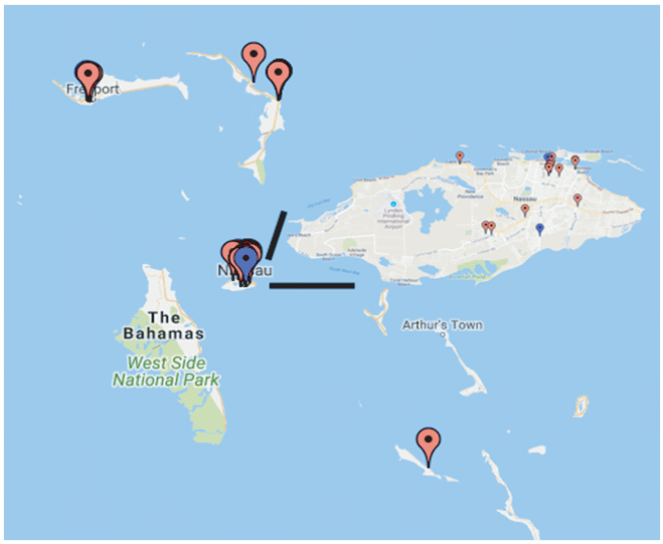

Fig. 1: Map to illustrate the sample area for the study with New Providence being the focus. Red markers for private clinics, blue markers for public clinics.

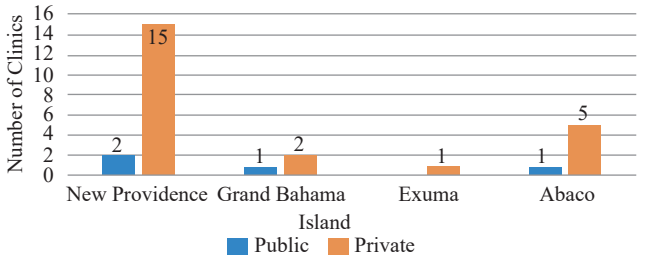

Fig. 2: Clustered column chart showing the number of private and public clinics that participated in the study.

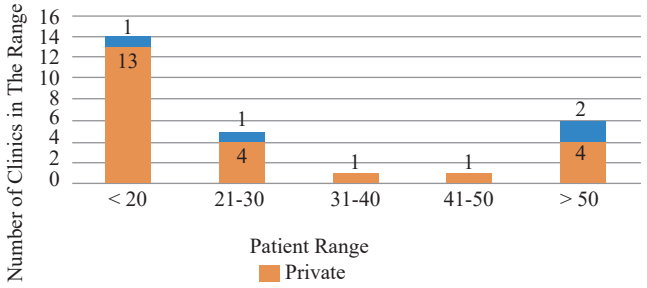

Fig. 3: A stacked column graph showing the range of patients in public and private clinics being treated in a workday.

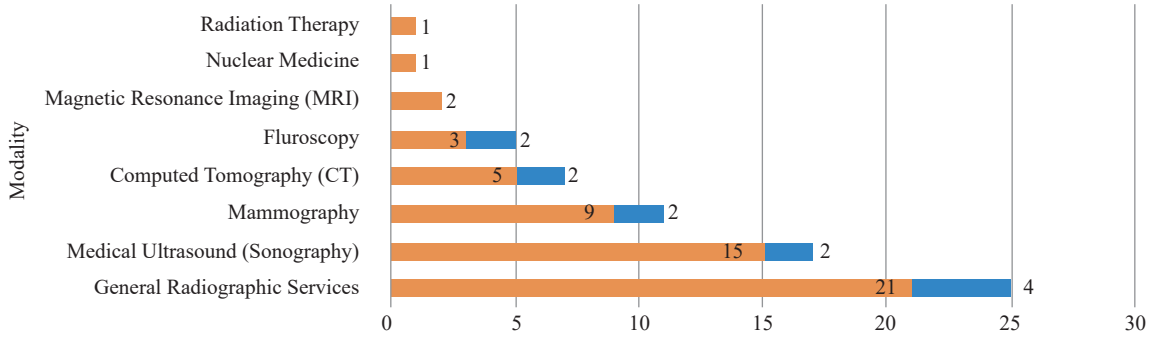

Fig. 4: A stacked bar graph showing the number of private and public clinics in the study that utilized a specific modality.

highlighted the most common modality as general radiographic services, which includes dental X-ray, identified in 93% of the clinics. Medical ultrasounds were offered by 63% of the clinics. Other services offered included: mammography in 41% of the centres, computed tomography (CT) offered by 26%, fluoroscopy was provided by 19% of the centers, magnetic resonance imaging (MRI) by 7%, radiation therapy and nuclear medicine was offered by 4% of the clinics, respectively.

Figure 5 depicts how often public and private clinics, respectively, performed quality assurance (QA) checks. For private clinics; QA checks were performed both quarterly, as well as annually, most frequently (six clinics each); followed by monthly (four clinics). Four clinics expressed the lack of a QA system and thus, were unable to verify the frequency of their QA checks. Regarding public clinics, QA checks were performed annually for one clinic and monthly for another. Two clinics expressed the lack of a QA system and thus, could not answer.

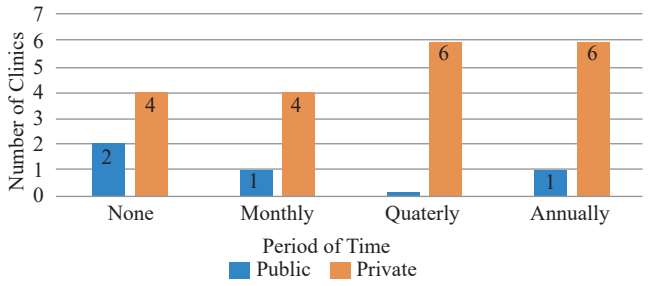

Fig. 5: A cluster bar graph showing how often public and private clinics perform QA checks.

DISCUSSION

The study focussed on New Providence as the primary sample area, based on it being the nation's capital, as well as, having the largest population. Approximately 63% of the clinics examined in this study were located in the primary sample area. Grand Bahama, Abaco and Exuma are the 2nd, 3rd and 6th largest Islands in term of population (5), respectively. As mentioned in the February 2017, Pan-American Health Organisation's (PAHO) country report, The Bahamas has three public hospitals and more than 90 clinics (6). This study investigates which/how many of the 93 listed health clinics employ medical radiation. The study concluded a positive response rate of 81%, in which 96% of the respondents of the questionnaire were full-time employees and the remaining 4% were part-time employees. Of the 50 respondents, only two of them were medical physicist. It should be noted that there is no local certification board for physicists and as such, prospective individuals must procure their credentials from foreign entities. Approximately, 85% per cent of the examined clinics were privately owned. Public clinics are the primary providers of healthcare in The Bahamas as detailed in the PAHO report, but only a few offer medical radiation services as noted in the study's results. It is also noted that a large number of these clinics are located near each Island's respective urban areas.

On average, the clinics administered radiation in excess of 50 patients daily or less than 20 conversely. Approximately, two of the four public clinics examined experience a higher patient influx. Public clinics were government subsidised and therefore, able to offer more affordable services. Another factor which may influence the volume of patients experienced by both public and private clinics are the sizes of the establishments, respectively. Public clinics, which are larger, can facilitate a higher volume of patients; whereas private clinics were noted to be smaller in size and experienced a lower volume of patients. The study saw approximately 74% of private clinics having a patient load of fewer than 30 patients daily.

Private clinics offered a wider range of services; the larger private clinics offered multiple modalities, such as: general radiographic services, ultrasounds and mammograms. General radiographic services were the most common and plausibly so. Dentists and some doctor's offices only require the use of an X-ray machine; outsourcing would pose its challenges, as well as, an X-ray machine would be cheaper to maintain than most other forms of equipment. Ultrasounds are another convenient service which is relatively inexpensive to maintain. Women's health offices often offer this service. Magnetic resonance imaging (MRI), radiation therapy and nuclear medicine were the least common modalities and correlated with high procurement costs and maintenance fees. Aside from being expensive to procure, radionuclides propose a host of legal challenges to obtain. As such, they are a less feasible option. Radiation therapy is another expensive service, obtaining that initial capital may be difficult. The study highlighted the frequency with which QA checks were conducted. As previously mentioned, only two medical physicists participated in the survey and from their interview, it ascertained that though there were local technicians that conduct machine maintenance, most of the clinics in The Bahamas outsourced to someone to carry out QA checks on their machines.

The most common time periods for QA checks were annually and quarterly. The clinics that offered multiple services performed QA checks at varying periods, which was dependent on the machine. These clinics cited checks were performed monthly, quarterly, biannually and annually. A concerning fact was that 21% of privately owned clinics and 50% of publicly owned clinics, highlighted the fact that no QA system was in place. This in effect will lower diagnostic accuracy, as well as, increase the risks associated with radiation treatment.

The main limitation of the study was transportation as no financial support was garnered to conduct this research. Thus, instead of flying to the respective outer-islands involved, the clinics were called and emailed, which negatively affected the success rate of interviews and questionnaire completion. This also negatively affected the sample size of the study, which was smaller than intended. This is the first study of its kind to be carried out in The Bahamas; the details of which will prove to be useful to the healthcare industries.

CONCLUSION

Most of the clinics in The Bahamas utilizing medical radiation were privately owned. Additionally, these clinics often opt to outsource technicians and physicists to perform quality assurance checks on the necessary equipment. This suggests a need for qualified local staff. Further studies are required to assess the full extent of the country's needs, regarding medical radiation and the best approach to the subject.

ACKNOWLEDGEMENTS

The authors acknowledge the support of the International Atomic Energy Agency to the Medical Physics Master's program in Jamaica, The Bahamas Ministry of Health for their assistance with identifying the medical clinics, the study participants, research assistant (Jasmine Ferguson) and proof-reader (Zahra Ricketts) for their contributions to the project.

Author Contributions

J Isaacs conceived the paper, oversaw data collection, dealt with data analysis, wrote the manuscript and approved the final version. M Voutchkov supervised the research paper, oversaw development of the paper and approved the final version. B Brevitt participated in study design, oversaw development of the paper and approved the final version. The authors declare that they have no conflict of interest.

REFERENCES

1. (IAEA) OoLA. Bahamas, Commonwealth of the 2013 [cited 2018 April]. Information on IAEA member The Bahamas]. Available from: https://ola.iaea.org/ola/FactSheets/CountryDetails.asp?country=BS.
2. Government B. Hospitals and Health Care Clinics Regulations. In: Health Mo, editor. 2000.
3. Government B. Ionising Radiations (Workers' Protection). 2001.
4. Sungita YY, Mdoe SSL, Msaki P. Diagnostic X-ray clinics as per quality control performances in Tanzania. J Appl Clin Med Phys 2006; **7:** 66–73.
5. The Bahamas Census of Population and Housing 2010. In: Statistics TDo, editor. 2010. p. 2.
6. P.A.H.O. Country Report Commonwealth of The Bahamas. P.A.H.O. February 22, 2017.