

Knowledge Sharing Practice and Its Associated Factors Among Healthcare Providers at University of Gondar Comprehensive Specialized Hospital, North West Ethiopian: Cross-sectional Study

Addisalem Workie Demsash (✉ addisalemworkie599@gmail.com)

Mettu University <https://orcid.org/0000-0002-9356-8126>

Biniyam Chakilu

Gondar University

Atsede Mazengia

Gondar University

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Abstract

Background

In healthcare, information and knowledge needs of health care providers arise in the patient care process. However, the right information and knowledge at the right time and place to the right person is not reached so far yet. Thus, leads limited knowledge sharing practice among health providers in Ethiopia.

Objectives

The objectives of the study were to assess knowledge sharing practice and associated factors among healthcare providers at University of Gondar hospital.

Methods

Institutional based cross-sectional study design was conducted through stratified simple random sampling technique among 423 samples from February 24 up to March 27, 2020. Pretested and self-administered questionnaire was used. Epi info version 7 and stata version 15 software were used for data entry, processing and analysis respectively. Descriptive statistics and multivariable logistic regression model were applied to describe the study objects and to assess knowledge sharing practice and its associated factors by considering P value ≤ 0.05 .

Results

423 respondents were participated with 100% response rate. From the total respondents, 222 of 423 (52.48%) of respondents were male. More than two third (66.90%) of respondents were degree and diploma holders. Nearly three fourth of 423 (74.70%) healthcare providers were under the age group of 21–30 years. The level of knowledge sharing practice among the respondents was 65.01% (95% CI: 60.46–69.56). In multivariable logistic regression model awareness AOR = 2.44, 95% CI= [1.32–4.50], willingness AOR = 1.96, 95% CI= [1.10–3.53], loss of knowledge power AOR = 0.192, 95% CI= [.12-.32], availability of health information resource AOR = 2.00, 95% CI= [1.56–5.38] and opportunity AOR = 2.91, 95% CI= [1.71–4.95] were significantly associated with knowledge sharing practice.

Conclusions

Knowledge sharing practice of healthcare providers is higher as compared with most studies conducted in Ethiopia. However, it needs further opportunity, resource allocation and supportive leadership.

Introduction

Knowledge is know-how, the combination of facts and information which is learned through practice in the health institutions[1]. It originates from an individual's intelligence but it exists in the routines, procedures, and norms of the health organization [2, 3]. Knowledge sharing is the deliberate act of communication between the healthcare staff to disseminate knowledge within and across the health organization for retrieval and recycle use of knowledge to improve group interaction, relationship, and performance of their staff [4–6]. plus, individuals share what they get through training and workshop and transmit what they know to the others [7].

Knowledge sharing is the key component of knowledge management and performance improvement system. Effective knowledge-sharing practices have the potential to give healthcare organization a sustainable competitive advantage[8]. Knowledge management has been widely studied in most disciplines such as business, education, agriculture, healthcare etc. Knowledge management in healthcare involves the integration of healthcare providers, technologies and processes to ensure the timely availability of ideas and knowledge, expertise and experience to enhance the delivery of quality care [9]. Knowledge sharing among healthcare providers enables to learn, retain experiences from staff, facilitates knowledge retrieval and use, makes the health sector more competitive[10].

According to WHO 2016, resource-limited countries face many challenges such as delays in healthcare service delivery, inadequate healthcare providers, lack of ICT and infrastructures and data repository centers [1, 4]. In the US and Netherland, 30–45% of patients are not receiving care according to scientific evidence and that 20–25% of the care provided is not needed/ harmful[11, 12]. Moreover, high-quality evidence is not consistently applied in practice[13]. Thus, leads to around 98,000 patients lost their lives each year in US and 11% of admitted patients develop an adverse event from this, 48% are preventable if the right knowledge is shared and applied in United kingdom[14].

In Ghana, healthcare providers don't share knowledge due to lack of expertise, network failure[15] and they don't understand the importance and the best ways of knowledge sharing mechanism[2]. So, patients are not receiving treatment due to delays in knowledge sharing [10]. In healthcare, information and knowledge needs of healthcare providers arise in the patient care process[3]. But, the right information and knowledge at the right time and place to the right person is not reached[16]. Thus, leads to miss and wrong diagnosis, a marvelous amount of medical resources and knowledge are wasted [17]. Study done about experience and information sharing in Ireland, 56.3% of mental healthcare providers confirms that they have encountered challenges for accessing information and experience from their team [18]. In China, 61% of healthcare providers confirms that knowledge Sharing practice is too limited [19]. In Malaysia and Jordan hospitals, 57.2% and 73% of healthcare providers have the culture of knowledge sharing practice respectively [20, 21]. A study done in Ghana qualitatively, the hospitals don't have any formal healthcare knowledge systems for knowledge and experience sharing[15].

As study conducted in Ethiopia, in Addis Abeba at 2014 and 2011, about 49.0% and 50.3% of healthcare providers have knowledge sharing practice respectively [22, 23]. In Bahirdar, Mekelle, North Shewa and Assossa indicate that there is 19% [24], 49.18% [25], 66.6% [7] and 23% [26] knowledge sharing practice

among health care providers respectively. Study show at UoG referral hospital, the level of knowledge of healthcare providers regarding infection prevention and adult cardiopulmonary resuscitation (CPR) is low and suboptimal respectively[27, 28]. According to the literatures, knowledge sharing practice of health providers in Ethiopia is limited and this all makes healthcare providers work by rereading their school and training materials [7, 22]. Thus, leads to problems i.e. financial loss, disability and death of patients [1, 24, 29]. Having all those, there is clear gaps about knowledge sharing practice. So, this study would be an evidence for prime stakeholders to address the gaps which is known according to the literatures.

As a result, this study aims to assess knowledge sharing practice and its associated factors among healthcare providers at the UoG comprehensive specialized hospital.

Methods

Study design and setting: Institutional based cross-sectional study design was conducted to determine knowledge sharing practice and its associated factors among healthcare providers at the UoG referral hospital from February 24 up to March 27, 2020. This hospital is one of the oldest hospitals among medical schools in Ethiopia. It is established in 1954 as a public health college and training institute which is 738 km far from the capital city of Ethiopia (Addisabeba). It provides a full range of health care services for the whole communities. According to the HR (human resource) of the hospital, currently the hospital has total of 1336 healthcare providers from these 389, 523, 162, 123, 71 and 68 were doctors, nurses, midwifery, laboratorist, pharmacist and other health care providers (anesthesia, optometry and psychiatry) respectively.

Study populations: All healthcare providers who are working at the UoG comprehensive specialized hospital were the source population. The selected healthcare providers who are permanently working at the UoG hospital were the target/study population.

Inclusion and exclusion criteria: All the selected healthcare providers who are available at UoG comprehensive specialized hospital during data collection period were included. All the selected healthcare providers who were seriously ill and on annual leave during the data collection period were excluded.

Sample size determination: Sample size (n) was determined both by using single population proportion formula by using 50.3% of Knowledge sharing practice among healthcare providers from previous similar study [23], with Standard deviation ($Z_{\alpha/2} = 1.96$) and margin of error ($d = 5\%$) at a 95% confidence level. The total sample size with the adjustment of none response rate (10%) = $384.1462 + 38.41462 = 422.56082 \approx 423$

Sampling procedures: First, the list of healthcare providers was retrieved from the HR department of the hospital. Then, the healthcare providers were stratified based on their profession. Having thus, proportional number of healthcare providers were selected from each stratum using simple random sampling technique with lottery method. The list of healthcare providers in each department was used as

the sampling frame to apply simple random sampling techniques after stratified. There were 389, 523, 162, 123, 71 and 68 doctors, nurses, midwifery, laboratorist, pharmacist and other health care providers (anesthesia, optometry and psychiatry...) in the hospital during the study period respectively (Fig. 2).

Variable of the study and measurements: The dependent variable studied was knowledge sharing practice. Whereas, the independent variables include various socio demographic characteristics (age, sex, educational status, and experience) individual factors (willingness, openness, awareness, perceived loss of knowledge), organizational factors (supportive leadership, resources allocation, opportunities), health knowledge source (teamwork, health information resource availability of report and documentation), ICT and communication channel. Mean scores for all variables were calculated and used as a cut point to dichotomize the variable. Knowledge sharing practice was measured by using twelve closed-ended questions with Likert scale response option ranging from strongly disagree to strongly agree. The score with the mean and above show there is knowledge sharing practice and below the mean shows there is no knowledge sharing practice among them [30]. Awareness was measured by four closed-ended Likert scale questions with response option ranging from strongly disagree to strongly agree. The score with the mean and above was considered to have awareness and the value below mean score considered as didn't have awareness about knowledge sharing [23].

Perceived loss of knowledge power is an individual's perception that knowledge sharing would reduce personal competitiveness, waste time and increase work load. It was measured by three close ended Likert scale questions and the score with mean and above the mean shows they had PLKP unless they had no PLKP[31]. Opportunity was measured with four close ended questions and the response of each question was likert scale ranging from strongly disagree to strongly agree. and the score with the mean and above show there is an opportunity for knowledge sharing practice, otherwise there is no opportunity for KSP[31].

Health information resource was measured by five close ended questions with likert scale response options from strongly disagree to strongly agree and the score with mean and above show that there is the availability of health information resource and below the mean indicates that there is no availability of health information resource.

Data collection procedure: Self-administered structured questionnaire was used to collect the required data. It was adopted from similar articles [7, 25, 30, 32, 33]. Some modification was done in line with the objectives of this study. The tool contain questions about knowledge sharing practice, and factors affecting knowledge sharing practice of healthcare providers such as socio-demographic characteristics, individual and organizational factors, communication channel and source of health knowledge (Online supplementary file 2).

Data quality assurance: Clear and unambiguous structured questionnaire were used. Pre-test was done to the 5% of the total sampled healthcare providers at koladiba district hospital to ensure the consistency and clarity of the questionnaire and appropriate measure was done accordingly. One day intensive training was given for 5 data collectors and 3 supervisors on the aim or objective of the study, how to

approach study subjects, how to use the questionnaire, and how to supervise and collect data. Close supervision were done during data collection period by the investigator and supervisors. The collected data was reviewed and checked manually by the investigator and supervisors for its completeness, accuracy and legibility.

Methods of analysis: The data were entered into Epi info software version 7 before analysis for coding, data cleaning and crosschecking. Stata software version 15 was used for data processing and analysis. Descriptive analysis was done to describe the study objects. Variables in the bivariable logistic regression analysis with **p** value < 0.02 were considered for further analysis. Multivariable logistic regression was done to know the relation between depend and independent variables. Finally, variables with **p** value \leq 0.05 were considered as factors associated with knowledge sharing practice. Crude and adjusted ORs with 95%CI were calculated to measure the strength of association between the dependent and independent variables. Hosmer lemeshow test was used to check the model fitness.

Results

Socio-demographic characteristics:

A total of 423 healthcare providers were participated in this study with 100% response rate. From the total respondents, 222 of 423 (52.48%) of respondents were male and more than two third (66.90%) of respondents were degree and diploma holders. Nearly three fourth (74.70%) of healthcare providers were under the age group of 21–30 years and nearly one-thirds (29.08%) of healthcare providers were general practitioners and specialties next to nurse professions (39.24%). Majorities (83.92%) of healthcare providers had less than and equal to ten (\leq 10) years of working experience (Table 1).

Table 1
Socio-demographic characteristics of healthcare providers in UoGRH, 2020

Variable	Category	Frequency (n)	Percent (%)
Sex	Female	201	47.52
	Male	222	52.48
Educational status	Degree and below	283	66.90
	Master	17	4.02
	Gp and above	123	29.08
Age (in years)	21–30 Years	316	74.70
	31–40 Years	93	21.99
	> 40 Years	14	3.31
Professions	Nurse	166	39.24
	Pharmacy	22	5.20
	Laboratory	39	9.22
	Doctors	123	29.08
	Midwifery	51	12.06
	Other	22	5.20
Experience	<=10 years	355	83.92
	> 10 years	68	16.08

Knowledge sharing practice of healthcare providers:

From the total healthcare providers, more than sixty (65.01%, 95% CI: 60.46–69.56) percent of healthcare providers had knowledge sharing practice whereas 34.99% of healthcare providers didn't have the practice of knowledge sharing (Table 2).

Organizational and individual factors for knowledge sharing practice:

In the perspective of organizational factors, only 261 of 423 (61.70%) of respondents had extrinsic motivation for knowledge sharing practice. However, 226 of 423 (53.43%), 265 of 423 (62.65%) and 285 of 423 (67.38%) of healthcare providers reveals that they didn't have opportunity, supportive leadership and resource allocation for knowledge sharing practice respectively.

According to individual's factors, more than half of 423 (52.25%) of healthcare providers were satisfied to their job. 388 of 423 (91.73%), 352 of 423 (83.22%), 334 of 423 (78.96%), 342 of 423 (80.85%), and 244 of 423 (57.68%) of the respondents had trust, awareness, willingness, intrinsic motivation and openness about the knowledge sharing practice respectively. But 237 of 423 56.03% of respondents didn't perceive about the loss of knowledge power for knowledge sharing practice (Table 2).

Table 2
Organizational and individual factors for knowledge sharing practice at University of Gondar referral hospital, 2020.

Variable	Category	Frequency(#)	Percent (%)
Knowledge sharing practice	Yes	275	65.01
	No	148	34.99
Extrinsic motivation	Yes	261	61.70
	No	162	38.30
Opportunity	Yes	197	46.57
	No	226	53.43
Supportive leadership	Yes	158	37.35
	No	265	62.65
Resource allocation	Yes	138	32.62
	No	285	67.38
Job satisfaction	Yes	221	52.25
	No	202	47.75
Trust	Yes	388	91.73
	No	35	8.27
Awareness	Yes	352	83.22
	No	71	16.78
Willingness	Yes	334	78.96
	No	89	21.04
Perceived loss of knowledge power	Yes	186	43.97
	No	237	56.03
Intrinsic motivation	Yes	342	80.85
	No	81	19.15
Openness	Yes	251	59.34
	No	172	40.66

Information communication technology (ICT) and communication channels:

With regards to information communication technology, 227 of 423 (53.67%) of the respondents were agreed/strongly agreed on the availability of ICT infrastructure (internet, intranet) in the hospital and 72 of 423 (17.02%) were neutral. 197 of 423 (46.57%) of the respondents were agreed/strongly agreed the presence of technical support and maintenance on ICT system and 65 of 423 (15.37%) were indifferent. 174 of 423 (41.14%) of the respondents were agreed/strongly agreed that they use email to communicate with their colleague. On the other hand, 235 of 423 (55.56%) of the respondents were disagreed/strongly disagreed with the presence of electronic storage (such as database) to access knowledge and the remaining 23.17% of the respondents were indifferent and 170 of 423 (40.19%) of healthcare providers agreed/strongly agreed that there is training for ICT system where as 78 of 423 (18.44%) were neutral (Appendix A).

About the communication channels, 323 of 423 (76.36%) and 304 of 423 (71.87%) respondents indicate that face to face communication, manual and medical record system were major communication channels for knowledge sharing practice in the hospital respectively. 240 of 423 (56.74%) healthcare providers stated that using mobile phone for conversion and SMS text message serve as communication channels for knowledge sharing purpose. 280 of 423 (66.19%) healthcare provider indicate that accessing internet is also another communication channels to share knowledge but only 159 of 423 (46.1%) healthcare providers confirmed that using email is one of the channels for knowledge sharing in the hospital (Appendix A).

Major source for health knowledge: From the total respondents, 298 of 423 (70.45%) and 341 of 423 (80.61%) of healthcare providers indicate that teamwork and health information resource (books, workshop, training, internet and guideline) were major source of health knowledge in the study area respectively. 209 of 423 (49.41 %) and 205 of 423 (48.46 %) of respondents reveals that reviewing reported file and documented files are also source of health knowledge at the university of Gondar comprehensive specialized hospital (Table 3).

Table 3
Major source of knowledge at university of Gondar referral hospital, 2020.

Major source	Response	Frequency	Percent
Team work	Yes	298	70.45
	No	125	29.55
Reviewing reported file	Yes	209	49.41
	No	214	50.59
Reviewing documented file	Yes	218	51.54
	No	205	48.46
Health information resources	Yes	341	80.61
	No	82	19.39

Factors associated with knowledge sharing practice:

A total of 23 variables were entered in to the binary logistic regression model. From these variables, extrinsic motivation, openness awareness, supportive leadership, willingness, resource allocation, information communication technology (ICT), Perceived loss of knowledge power, job satisfaction, communication channels, opportunity, and the available health information were turned out to be significant factors associated with knowledge sharing practice from bivariable analysis. However, in multivariable logistic regression analysis, awareness, willingness, Perceived loss of knowledge power, opportunity, and the availability of health information resource were identified as significant factors (Table 4).

Respondents who have awareness about the knowledge sharing practice were 2.4 [AOR = 2.44, 95%CI (1.32–4.50)] times higher to share knowledge than those who didn't have awareness about knowledge sharing practice and healthcare providers who are willing to share knowledge were 2.00 [AOR = 1.96, 95%CI (1.10–3.53)] times more likely to share knowledge than those who weren't willing to share knowledge. Respondents who have perceived loss of knowledge power were 81% [AOR = 0.19, 95%CI (.12-.32)] less likely to share knowledge than those who didn't have perceived loss of knowledge power. Respondents who have availability of health information resource (HIRs) and the opportunity for knowledge sharing practice were 3 [AOR = 2.00, 95%CI (1.56–5.38)] and 2.9 [AOR = 2.91, 95%CI (1.71–4.95)] times higher to share knowledge than those who didn't have availability of HIRs and opportunity for knowledge sharing practice respectively (Table 4)

Table 4

Bivariable and multivariable analysis of the selected variables associated with knowledge sharing practice among healthcare providers, 2020.

Variables	Knowledge sharing practice				
		No	Yes	COR-95%CI	AOR-95%CI
Awareness	Yes	109 (25.77%)	243(57.45%)	2.72(1.62– 4.57)*	2.44 (1.32– 4.50)**
	No	39(9.22%)	32(7.57%)	1	1
Willingness	Yes	104(24.59%)	230(54.37%)	2.16 (1.34– 3.48)*	1.96 (1.10– 3.53)**
	No	44(10.40%)	45(10.64%)	1	1
PLKP	Yes	101(23.88%)	85(20.09%)	.21(.14-.32)*	.19 (.12-.32)**
	No	47(11.11%)	190(44.92%)	1	1
Job satisfaction	Yes	63(14.89%)	158(37.35%)	1.82(1.22– 2.73)*	1.53 (.91-2.55)
	No	85(20.09%)	117(27.66%)	1	1
Extrinsic motivation	Yes	73(17.26%)	188(44.44%)	2.22(1.47– 3.35)*	1.51 (.89-2.56)
	No	75(17.73%)	87(20.57%)	1	1
Openness	Yes	67(15.84%)	184(43.50%)	2.44(1.62– 3.68)*	1.52 (.91-2.56)
	No	81(19.15%)	91(21.51%)	1	1
Opportunity	Yes	41(9.69%)	156(36.88%)	3.42(2.22– 5.27)*	2.91 (1.71– 4.95)**
	No	107(25.30%)	119(28.13%)	1	1
Supportive leadership	Yes	44(10.40%)	114(26.95%)	1.67(1.10– 2.56)*	1.21(.70 – 2.10)
	No	104(24.59%)	161(38.06%)	1	1
Resource allocation	Yes	29(6.86%)	109(25.77%)	2.69(1.68– 4.32)*	.96 (.52-1.78)
	No	119(28.13%)	166(39.24 %)	1	1
ICT available	Yes	62(14.66%)	160(37.83%)	1.93(1.29– 2.89)*	1.61(.98-2.65)
	No	86(20.33%)	115(27.19%)	1	1

Variables	Knowledge sharing practice				
HIRs Availability	Yes	95(22.46%)	246(58.16%)	4.73(2.84–7.89)*	3.00(1.56–5.38)**
	No	53(12.53%)	29(6.86%)	1	1
Communication channels	Yes	109(25.77%)	231(54.61%)	1.88(1.15–3.06)*	1.00(.51-1.92)
	No	39(9.22%)	44(10.40%)	1	1

* Significant in COR at 95% CI, ** Significant in AOR at 95% CI, 1...reference category

Discussion

In this study, the total knowledge sharing practice among healthcare providers was 65.01% (95% CI: 60.46–69.56). This finding was in line with study done in Public Hospitals in North Shoa (66.6%) [7]. But, this finding is higher as compared with study done in hospitals under Addisabeba health bureau (49.0%) [22], Gonji Kolella District(41.9%)[30], Yekatit12 hospital (53%) [34], in Mekelle public hospitals (41.18%) [25]. This variation could be due to the presence of extrinsic motivation (58.87%) and health information resource (80.61%) which is identified in this study. Additionally, possible reasons might be the difference of awareness, willingness, ICT access and presence of communication channels. However, the finding of this study is less than study done in Jordanian Hospitals (73%)[21]. This may be due to difference in level of experience, level of education and difference in the communication and flow of knowledge in the organization[21].

The odds of healthcare providers who had awareness about knowledge sharing practice were 2.4 times higher to share knowledge than who didn't had awareness. This finding is supported by the report from St. peter's hospital which reveals that in the presence of awareness, the probability of knowledge sharing were 0.09 score more than in the absence of awareness[31]. The finding is also supported by Felege Hiwot referral hospital' reports which stated that "If employee are not aware about the knowledge sharing practice, they may not participate in knowledge sharing activity." [24]. This means, if healthcare providers aware about knowledge sharing, they participate on it. Having this, 83.22% of the respondents had awareness about the knowledge sharing practice which is identified in this study. The odds of respondents who are willing to share knowledge were 2.00 times higher to share knowledge than those who aren't willing. This result is supported by study done in Felege Hiwot referral hospital which indicate that knowledge sharing practice depends on the willingness of healthcare providers[24]. In addition, this funding is supported with studies done in Malaysia 2009 and 2008 stated that if employee had trust and awareness about the knowledge sharing, they would be willing to share knowledge[35, 36]. Having this, 91.73% and 83.22% of respondents in this study had trust and awareness respectively.

This study reveals that healthcare providers who had perceived loss of knowledge power were 80.8% % times less to share knowledge than who didn't perceive loss of knowledge power. This may be due to

misunderstanding about the significance and benefits of knowledge sharing practice [20]. Some healthcare providers are afraid that they will lose position in the organization, if they shared their knowledge to their colleagues[37]. This finding is consistent with study done in Jordan hospital stated that since knowledge is source for power, some might think that they sacrificing their power while they shared their knowledge for others [21]. The respondents who had knowledge sharing opportunities were 2.91 times higher to share knowledge than who didn't have an opportunities. This finding is supported by the report from Gonji Kolella District hospital, Felege Hiwot referral hospital and Mekelle public hospital [24, 25, 30]. Additionally, this finding is consistent with study done in public hospital of North Shoa stated that the higher knowledge sharing opportunity in the hospital, the more likely healthcare providers to practice knowledge sharing [7]. Having this, majorities (60.52%) of respondents agreed/strongly agreed that there was informal knowledge sharing opportunity which identified in this study. As well, teamwork provides the opportunity for communication to share knowledge[26].

Concerning on health information resource, 80.61% of the respondents confirmed that they had availability of health information resource. This finding is higher as compared with study done at Public Hospitals in North Shoa that only 12% of healthcare providers had confirmed there were availability of health information resource for knowledge sharing activity[7]. This finding is also higher as compared with study done at Addisabeba that 71.0% of the respondents reported the absence of adequate health information resource in their study area[32]. This is may be due to that 58.63%, 53.66%, 56.74%, and 66.19% of respondents agreed/strongly agreed that there were books, workshop, guideline, and internet as a source for knowledge sharing practice respectively which was known in this study. Furthermore, the variation might be due to sample size difference.

Limitation of the study:

Since the study conducted by cross-sectionally, temporal relationship might be occurred in the degree of association between outcome and predictor variables.

The finding of the research could be more generalizable if it were conducted by including different health institution in Ethiopia. However, due to time, labor and money constraints the study was limited to university of Gondar hospital.

Conclusion

The overall prevalence of knowledge sharing practice among healthcare provider was higher as compared with studies conducted in Ethiopia. Awareness, willingness, health information resources, perceived loss of knowledge power and opportunity were significantly associated with knowledge sharing practice.

Ethical clearance:

Ethical approval was obtained from the ethical review board of the University of Gondar institute of public Health. Informed consent (verbal) was obtained from the study participants before the data collection. The purpose and aim of the study was clearly explained to the study participants to avoid any confusion and to make sure that the study is only for the stated objectives. Any information related to the study subject was kept in its confidentiality.

Recommendation:

It is good to conduct further study about knowledge sharing practice among healthcare provider's in different hospitals to make the study more representative.

Since knowledge sharing practice is one of the single concepts from broad concept of knowledge management, so further research about the knowledge management is strongly recommended.

Abbreviations

AOR.....Adjusted odds ratio

CL.....Confidence level

COR.....Crude odds ratio

CPR.....Cardiopulmonary resuscitation

GP.....General practitioner

ICT.....Information communication technology

UoG.....University of Gondar

Declarations

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Data availability:

All the data generated and analyzed during this study are included in this article and its supplementary information files.

Conflicts of Interest:

The authors declare that they have no conflicts of interests.

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Supplementary Files

Supplemental File 2 is not available with this version.

Figures

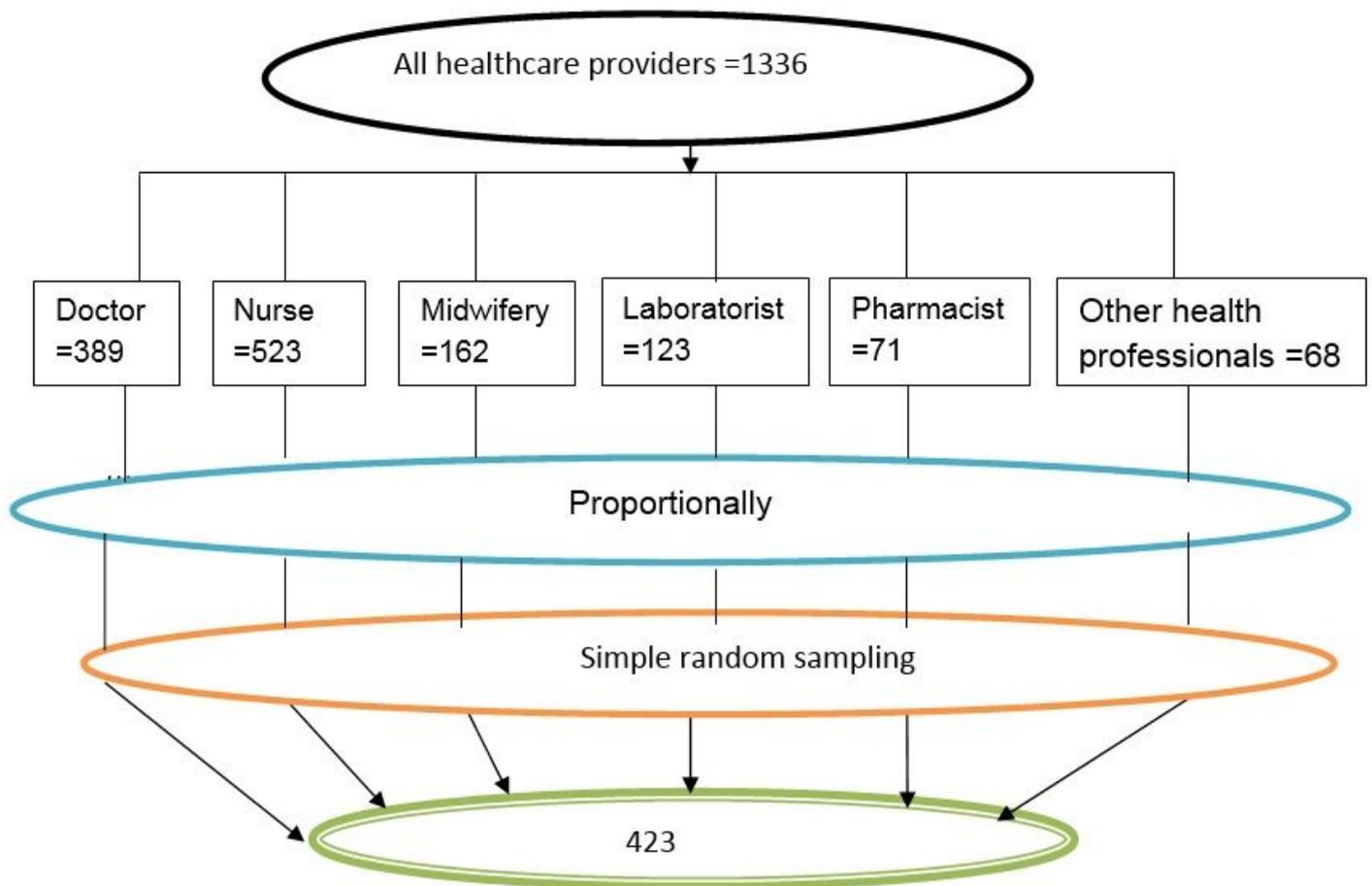


Figure 1

Sample drawing techniques

Supplementary Files

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- [AppendixA.docx](#)