Afr. J. Med. Med. Sci. (2022) **52(4) 239 - 245**

Time-to-dormancy of patient health records at the University College Hospital, Ibadan, Nigeria

BM Oweghoro[1], OM Akpa[2,3] and O Ayeni[2]
Departments of Library, Archival and Information Studies, Epidemiology and Medical Statistic and Institute of Cardiovascular Diseases, University of Ibadan, Ibadan, Nigeria.

Abstract
*Background***:** Experiences have shown that patient's record often become dormant due to cessation of healthcare and retaining dormant records waste time and resources for storage and may hinder retrieval of active patients' records. Knowledge of time-to-dormancy of these records is critical to formulation of retention and disposition policies for patients' records management. However, there is paucity of information on time-to-dormancy of patient's records in Nigeria. This study aimed at identifying the most suitable distribution for modelling time-to-dormancy, estimate dormancy rate and associated factors of records created at University College Hospital, Ibadan, Nigeria.
Methods: Of the 84,613 patient records created from 1990-1994, a sample of 1537 was systematically selected and reviewed. Information on patient's characteristics, including date of first and last visits were extracted from each record using a data extraction proforma. Data analyses were done using descriptive statistics and Kaplan-Meier methods to estimate time-to-dormancy and identify determinants of time-to-dormancy. Records with single-entry indicating patients with one contact were censored. Cox, Exponential and Weibull survival models were fitted to the time-to-dormancy data to test for best fit.
Results: Patient records that survived beyond the first contact, indicated by two or more entries had a Median Dormancy Time of 1.93 months with 95.0% becoming dormant at about 151.89 (SE of 12.31) months. Among the survival models tested the Weibull yielded the best fit for patient's records dormancy time data. The hazard ratios for records of admitted patients = *1.17 (95% CI, 1.53-5.75);* females = *1.10 (95%, CI, 0.95-1.25),* treatment-outcome = *2.97 (95% CI, 1.53-5.75)* were high, (HR>1), indicating higher-risk of dormancy compared to other patient characteristics examined.
Conclusion: Patient records followed Weibull distribution with average time-to-dormancy of 2.8 years. Based on this, a records retention and disposition policy of 13 years should be formulated.

Correspondence: Mr. B.M. Oweghoro, Deparment of Library, Archival and Information Studies, University of Ibadan, Ibadan, Nigeria. E-mail: bmoweghoro@gmail.com.

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Introduction

Patient's record contains information that are vital for healthcare, diagnosis, clinical and epidemiological investigation. Healthcare systems are information driven, and patient's record are key to their care; supporting clinical decision-making, provide evidence of activities, provide tools for research and act as witness in litigation, [1]

Health information and records management are by-products of healthcare processes and good records management practice is an important function of every successful healthcare organization. Teaching hospitals provide high quality patient care and in the process create volumes of information at every instance a patient is seen in the hospital and these become records that must be properly managed [1-2]. A patient's record could mean the difference between life and death in an emergency. It is the backbone of healthcare services and considered one of the important elements in patient care management. Good record management practice specifies policies and guidelines on retention and disposition of records. These policies and guidelines ensures that records created are organised, provide guidelines to locate and retrieve required records and particularly keeping what is needed only for as long as is required, [3-10].

One of the most significant challenges in healthcare is the ability to effectively manage patient information. Patient records often become dormant due to cessation of healthcare and the retention of a dormant record is wasteful in terms of time and resources for storage and may hinder retrieval of active patients' records. As technology improved, healthcare institutions are moving to an entirely electronic health records system, however most developing countries including Nigeria are yet to catch-up on this development, [11-13]. Regardless of the medium in which patient information resides, the concept of retention and dormancy holds. Studies had shown that the active life of some patients' records are relatively short and can be disposed of at dormancy, unfortunately in Nigeria, there are no documented policies or guidelines on retention and when to dispose of dormant records, [14-16].

The outcome is the retention of inactive i.e. dormant records in the filing system longer than necessary and with negative consequences on medical records management and poor patient care. It then suffices that the active period, time-to-dormancy (TTD), for which a patient's record should be retained needs to be estimated. Time-to-dormancy is the period between the first contact when a record is created and last contact. We shall define a dormant patient's record as the state of the record becoming inactive with no further entries inserted where such records can be safely weeded from the filing system creating space for new ones. Intuitively, the value of any information (patient information inclusive) is a function of the frequency of use over time. Information need not be kept after they are no longer required otherwise valuable resources and unnecessary cost may be wasted or incurred.

The need to estimate time-to-event endpoints of patient's record, in the hospital, where quality and cost efficiency interplay are challenging issues. Methods for estimating time-to-events data are not new in medical research and lots of work has been done in the area of disease and death, [17-21]. However, there is paucity of information on time-to-dormancy of patient's records in Nigeria. Knowledge of time-to-dormancy of these records is important to develop retention and disposition policies for patients' records. The University College Hospital, Ibadan, was established in 1948 with a well organised patient records management practices and with over 70 years of operation the hospital is yet to have a documented retention and disposition policy on patient records. This study was conducted to determine the statistical distribution, estimate time-to-dormancy of patient's record and determine associated factors at the University College Hospital, Ibadan, Nigeria.

Methods

Source of data and data extraction

A review of patient records from 1990-1994, a period of 25 years considered long enough to estimate time-to-dormancy was conducted at University College Hospital, Ibadan. From 84,613 available records created within the study period, systematic sampling technique was used to select 1537 records. Data on patient's characteristics (date of first and last visits, gender, age, clinic attended, and other clinical and treatment-outcomes) were extracted from each records using a data extraction proforma developed for the study.

The study variables and variable definition

The outcome variable was time-to-dormancy measured as the period from creation of a record to the point at which the record becomes dormant. This was measured as *"date of last entry – date of first entry;"* this is the survival time or life expectancy. Other study variables included predictors such as patient's characteristics including date of first visits, gender, age, clinic attended (Medical, Surgery, O & G, Children), and treatment-outcomes (discharges, DAMA and deaths).

Data management and Analysis

A large number of patient records with a single entry were found not used beyond the first day of creation (tagged "*one-day-active records*") were censored from the main survival analysis. These were then separately analysed, aimed at providing some information on how to recognise patients that would probably not make a second visits after the first visit. This information was to serve as an indicator for weeding one-day-active records at appropriate time.

Data analyses were done using descriptive statistics and Kaplan-Meier methods to estimated time-to-dormancy and identify determinants of time-to-dormancy. All analyses were performed using STATA version 12 at 5% significance level.

Results

Characteristics of One-Day-Active records

The study showed 470 (30.6%) of records created during the study period were active for only one day. A close look at the records to identify the group, show that records of male patients constitute 48.87%, patients residing in Oyo State were 48.72% and records from Surgical Outpatient clinic (SOP) clinics was highest with 30.0%. Only 0.01% of the patients had ever undergone surgery. None of the patients were admitted.

Characteristics of patients whose records surviving beyond first day of creation

Having excluded the 470 one-day-active records, analysis of the 1067 patient whose records survived beyond the first day of creation, revealed that 35.74% were aged between 31-60 years, 13.88% between 10-20 years of age, 19.70% were aged less than 10 years and 9.66% were above 60 years of age. Male patients constitute 51.11% while 48.5% of the patients reside in Oyo State. Medical Outpatient Clinic records (MOP) constituted 22.16%, while 24.95% of the records were from SOP, 2.89% from Children Outpatient clinic, 14.16% from Gynaecology and 25.84% were from all other clinics combined. About 31.02% of the patients were admitted, while 89.60% went through surgical procedures. Almost all the patients (99.62%) were alive at time of last contact, 0.28% were discharged against medical advice. (Table 1)

Table 1: Frequency distribution of some patient's characteristics

Variables n=1067	Level	Frequency	Percent
Age at Registration	<10	210	19.7
	10-19	148	13.8
	20-29	224	21.0
	30-59	381	35.7
	60+	103	9.6
Gender	male	530	51.1
	female	507	49.8
State of residence	Oyo State	489	48.5
	Others	519	51.4
Clinic attended	MOP	230	22.1
	SOP	259	24.9
	CHOP	30	2.8
	GYNE	147	14.1
	Others	372	25.8
Ever admitted	No	736	68.9
	Yes	331	31.0
Ever operated on	No	956	89.6
	Yes	111	10.4
Treatment outcome	Alive	1055	99.6
	Died	1	0.0
	DAMA	2	0.2
	referred	-	-

Survival time of patient's record

Estimates of the 25th, 50th, 75th and 95th percentiles for time between first and second contacts by patients (indicated by 1st and 2nd entries in the records), show that 25%, 50%, 75% and 95% of records had a second entry/contact in 0.43, 0.72, 1.37 and 6 months respectively. This result revealed that 95% of the patients whose records did not fail on the first day of creation are most likely to return for a second visit within 6 months, therefore one-day-active records can be conveniently weeded after 6 months.

The survival time (figure 1) of patient's records show a decreases as the age of records (dormancy time) increases and tends toward zero as time, t, approaches 291.5 months. Estimates of dormancy time for 25th, 50th, 75th and 95th percentiles of observed survival distribution for patient records show a MDT of 1.93 months, while 75.0 % attain dormancy at t = 17.11 months and 95.0% at 't' = 151.89 (SE of 12.31) months. (Table 2)

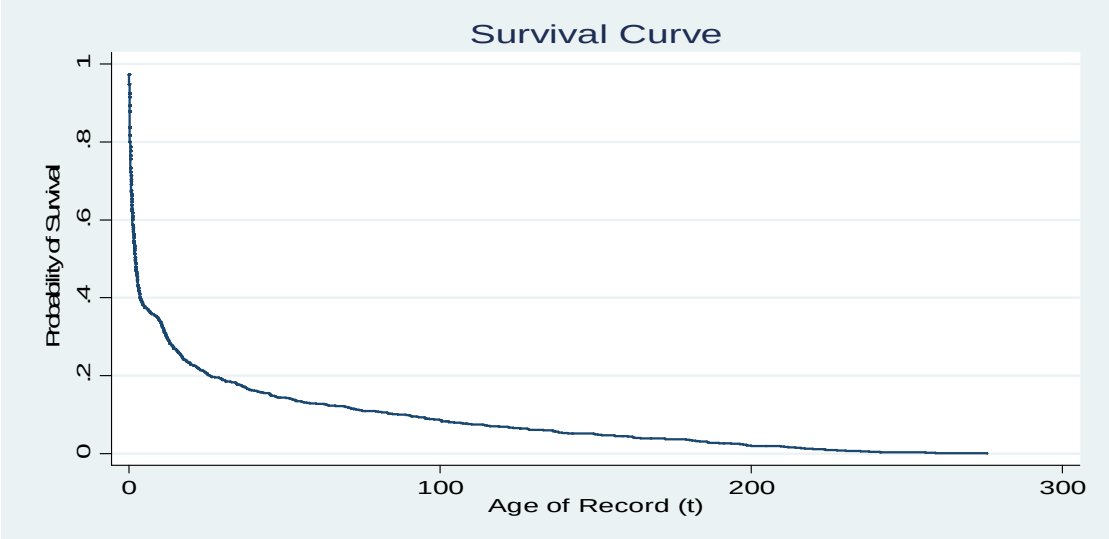

Fig.:1. Survival curve of time-to-dormancy (in months) of patients' records.

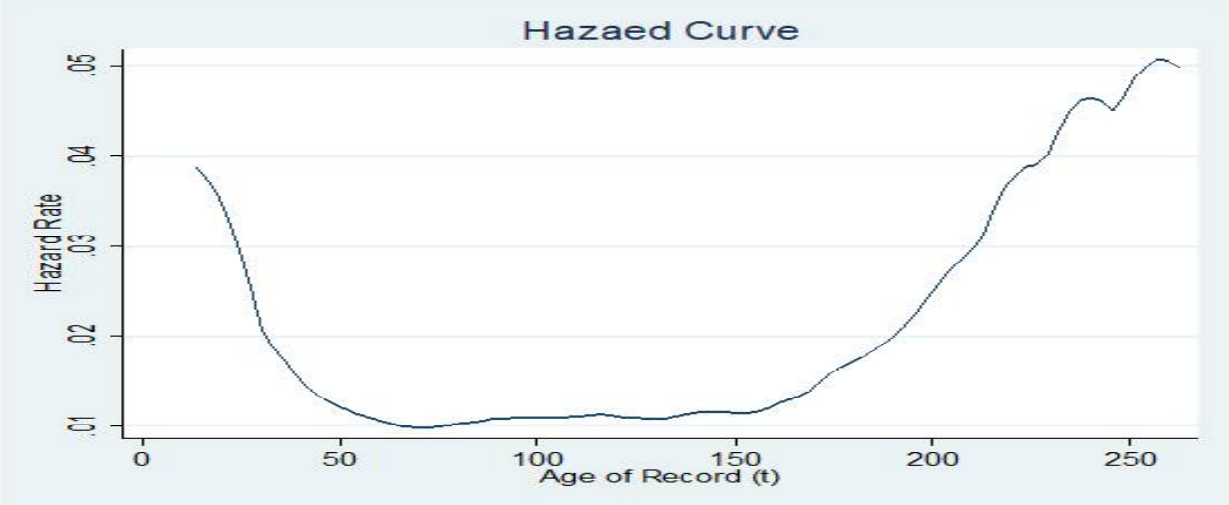

Fig. 2: Hazard plot of time to dormancy of patients' records

The hazard plot (figure 2) for the TTD of patient's record indicated a sharp decrease with age of records until time, t H" 60 months and then assumed a regular trend movement up to *t H" 150* months. The plot then increased sharply as age (dormancy time) increases forming a bathtub shape. Considering this U-shape, we tested for validity of Weibull distribution assumption using Weibull probability plot of Kaplan-Meier log-log Survival plot, *logH(t)*, against log survival time, *log(t)*. The result indicated a straight line relationship between *logH(t)* and *log(t)*, increasing monotonically with intercept of the straight line approximately (– 0.5813) with a slope of 0.3581. Value of the shape parameter,

f

for two parameter Weibull distribution was estimated as 0.5592 which is less than unity.

Table 2: Dormancy Time for patient records

Percentiles	t (months)	Std. Error	95% *CI*	
25th	0.45	0.04	0.39	0.49
50th	1.93	0.16	1.70	2.33
75th	17.11	1.86	14.29	21.88
95th	151.89	12.31	128.72	179.05

n = 1067

A semi-parametric (Cox Proportional Hazard) and parametric (Exponential and Weibull)

survival model were used to measure the influence of patient's demographic and clinical characteristics on dormancy time of record. The three survival models identified patient's gender, treatment outcomes, admitted and clinic attended as important predictors of record dormancy time as they were all significant at $p<0.05$, with Weibull model having the minimum -2logL and AIC values, (Table 3).

Table 3: Test of Models fit

Model	K-Parameter	-2LogL	AIC-value
Cox	7	11061.35	11075.35
Exponential	8	5904.87	5920.87
Weibull	9	4371.85*	4389.85*

Results of Global test for the proportional hazard assumption was insignificant, (Chi-square=6.29, p-value=0.51), this implies that the sample data did not violate the proportional hazard assumption, that the hazard of subject subgroup are proportional over follow-up period and therefore the global test indicated that for the data set used the assumption of PH is not violated.

Goodness of fit of time-to-dormancy models/ distributions

The three models (Cox, Exponential and Weibull) was then tested for best fit of records dormancy time data, Weibull model had the minimum log likelihood and equivalently minimise the information lost (from the AIC value) and was adjudged as the best model for each record dormancy time data cohort.

Regression on patient characteristics from the three models of dormancy time revealed that the hazard ratios for records of admitted patients, female and treatment outcome are at a higher risk (HR>1) compared to other patient characteristics, (table 4).

Discussion

The time-to-dormancy of record of patients seen at UCH, Ibadan was found to follow a typical *time-to-event* data that can be addressed by survival analysis techniques. Many of the patients' records had a single entry, suggesting the records were only used once and became dormant (inactive) after the first contact. Estimates however show that among those returning for a second visit, 95% had done so within 6 months after the first visit. The implication of this is that patients that failed to return for a 2nd contact after 6 months may never return again or has a very small probability (5%) of returning. This finding is closely related to the report by Aduku and Abdul (2012) and Records Management Bulletin (2012) that records become less valued with time and that 90% of the use of a record takes place during the first 3 months after it was created. Based on our experiences of this setting, such records can be declared dormant and safely weeded.

Also, the estimated time-to-dormancy of records that survived beyond the one-day after creation, (indicated by two or more entries), show that 95% of such records had an active life of 151.89 months. This finding has the implication that 95% of the patient's records became dormant in in approximately 13 years (151.89 months), with a probability of 95%. Such a record can therefore be safely weeded and disposed of to a secondary storage, with the confidence that less than 5% would return, thereby creating space for new records. Retaining patient records beyond this age will amount to large number of dormant records been kept along with active records. This is in agreement with Ngulube (2011) that it is common to see unused records occupying expensive space, and retaining such records is inefficient and uneconomical. The Weibull model with minimum -2logL and AIC values, was adjudged best fit for the time-to-

Table 4. Hazard ratios of dormancy time on patient characteristics

Predictors	Models								
	Cox PH	95% CI		Exponential	95% CI		Weibull	95% CI	
Age (rc <10)	0.92	0.87	0.97	0.87	0.82	0.92	0.93	0.88	0.98
Gender (rc male)	1.09	0.96	1.25	1.11	0.97	1.27	1.10	0.96	1.25
Oyo State (rc others)	0.89	0.78	1.01	0.77	0.67	0.87	0.87	0.76	0.99
Clinics (rc MOP)	1.00	0.96	1.04	1.00	0.96	1.04	0.99	0.95	1.03
Admission status*	1.19	1.00	1.41	1.05	0.88	1.24	1.17	0.98	138
Surgery status	0.84	0.65	1.08	0.89	0.69	1.15	0.81	0.63	1.05
Trt_Outcome* (rc alive)	4.01	2.02	7.94	19.85	0.00	37.74	2.97	1.53	5.75

dormancy data having identified patient's gender, treatment outcome, admission and clinic attended as important predictors of record dormancy time. The risk of dormancy was higher for females, admitted patients, and Surgical Out-patient Clinic patients compared to other patient characteristics. The implication is the need to weed such records early. Similarly, risk of dormancy was high for records of dead patients and DAMA being higher than other patient characteristics. Intuitively, a patient on admission will definitely receive more attention and continuous medical care with a high probability of shorter recovery period than an outpatient. Expectedly records of dead patients and DAMA patients will go into dormancy earlier and become inactive compared to records patient that is still alive. These records should therefore be considered for early weeding from the file to create filing space.

Conclusion

Large number of patient records created in UCH, Ibadan were used only once (identified by single entry) and go into dormancy (inactive) immediately after the first visit, while 95% of those with two or more visits became dormant after a period of 5.95 months. Records with two or more visits had 0.95 probability of dormancy in 151.89 months. Weibull model was observed to provide the best fit for distribution of dormancy time of records of patient created at UCH, Ibadan.

Recommendation

The hospital management should develop a records retention and disposition policy based on the 13 years' estimate, while records of the dead and DAMA patients be purged from active file. Patients that fail to return for a 2nd visit after 6 months should have their records weeded from active files regularly and moved to secondary storage to create space.

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