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# Health information technology in Nigeria: Stakeholders' perspectives of nationwide implementations and meaningful use of the emerging technology in the most populous black nation

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**Abstract:** *Background:* Nigeria is witnessing continuing advocacy and increase in number of individuals yearning for computerization of health information and healthcare processes. On the other hand, the Government of this most populous black nation is evolving plans and strategies for the adoption and implementation of health information technology (HIT). However, little is known about opinions of the diverse healthcare providers who would act the script of government in ensuring meaningful use of HIT in the country. *Objective:* This nationwide, cross-sectional study attempted to determine stakeholders' perspectives of the emerging HIT in Nigeria. *Result:* HIT stakeholders who gave consent ( $n=233$ ) at the two conferences participated in the study, 76% of whom were male professionals, mostly (117, 50.2%) from tertiary healthcare institutions. It worthy of note that three of the participants came from United States of America to attend the 1<sup>st</sup> National Conference on Health Information Technology in Nigeria. Of all participants, the majority (226, 99.1%) opined that HIT will improve communication among healthcare providers. A similar portion (223, 98.2%) were of the opinion that HIT will facilitate prompt retrieval of patient's health records on point-of-care (POC). Nearly two-third (139, 62.6%) were optimistic of possible realization of nationwide implementations of HIT in the country by the year 2020. The results also indicate that gender, professional inclination, and place of work were important predictors of positive opinion of HIT. The three factors were associated with stakeholders' opinion that the evolving HIT is capable of improving medical care quality ( $p=0.059$ ; 0.000; 0.014) of the Nigerian populace. Most stakeholders (61%) recommended that the paper-based health records should be archived post implementation of HIT. *Conclusion:* The Nigerian healthcare system is manned by providers and stakeholders who are quite abreast of the benefits of health information technology and are willing to embrace the technology in their workflow. This is quite reassuring and tends to prompt the healthcare decision makers to proactively formulate policies and introduce interventions to encourage nationwide acceptance of the emerging technology. Nonetheless, there is more to be done on appropriate clinical documentation in order to set a friendly pedestal for effective takeoff, successful implementations and meaningful use. Appropriate funding and financial incentives for quality improvement is recommended. In addition, the National Conference on HIT should be convened annually and a technical committee be set up to appraise future implementations.

**Keywords:** Computerized Physician Order Entry, Decision Support Systems, Electronic Health Records, Health Informatics, Health Information Management, Health Information Technology, Interoperability, Meaningful Use

## 1. Introduction

Health information technology (HIT) is the application of information processing involving the deployment of computers and computing technologies for storage, retrieval, sharing, and use of health information for communication and decision making to improve healthcare quality [1]. The technologies (HITs) include electronic health records (EHRs), computerized physician order entry (CPOE), health management information systems (HMIS), clinical decision support systems (CDSS), barcoding technology for medication administration, smart infusion pumps, automated dispensing machines and other technologies deployed in the management of healthcare [2-7]. The evolution of HIT began by the mid-1980s when the Institute of Medicine (IOM) in USA identified that new technologies should be considered for improving the state of health records and healthcare systems [8]. Huffman [9] recognized that the first health related ICT applications were those requiring arithmetic applications such as registration, admission, discharge and transfer (R-ADT); census; hospital statistics; abstraction of health records and indexing. HIT applications have been reported [10] to have provided easy and instant access to vital health information capable of improving provision of quality healthcare as well as informed decision making, to healthcare professionals, planners, managers, policy makers and national health agencies.

HIT has gained increased importance since 2001 when the Institute of Medicine declared it as one measure to improve the effectiveness and timeliness of healthcare delivery and patient safety [11]. Effective application of HITs with high interoperability and process simplification hold the impetus for substantial improvement as they are widely held as primary patient safety solutions [12, 2-7]. HIT improves the quality of, and enhances access to health information, brings increased healthcare efficiency and quality and enhances health communication strategies and research [13]. It facilitates data management tasks of health administrators [10] and improves access to the patient health records to the satisfaction of clinicians [14]. It reduces medical errors through prompt alerts and reminders [10]. HIT evolution has improved the sharing and real time access to patient health information on point-of-care [10] and it is facilitating healthcare delivery reform and reshaping the work of healthcare professionals [15]. In spite of the benefits and promises of HITs, other studies have reported challenges of the technology. For instance, studies have shown that its implementations could not go without significant risks to patients and providers [16]. Cases of fatal insulin overdose as a result of mix-up in the bar-coded wristbands [17], dehumanization as providers focused computer screens in lieu of their critically ill-patients [18], incorrect medications chosen from computerized pick lists [19], and most awful, escalation of paediatric mortality subsequent to computerized system [18]. Furthermore, researchers have reported that

sites where CPOE were implemented still experience high rates of medication errors and adverse drug events (ADEs) [20], errors related to entry, retrieval, communication and coordination of health information [21] and low adoption rate of HIT [22].

Of particular importance in this study is the fact that healthcare providers who are satisfied with their careers are more likely to stay in their practice and hence, care continuity is assured and care delivery enhanced. Elder et al [23] established that HIT was the strongest positive predictor of physicians' satisfaction with their careers. Adler-Milstein [24] opined that the expected efficiency and quality from HITs may become unrealistic except with change management in order to orchestrate meaningful use by both care providers and administrators. It has been said [25] that a good HIT application must not only be adopted and implemented but, must also be used in a meaningful way by providers so that the desired results such as reduced costs and improved care quality and safety are achieved. The standard of meaningful use strikes a balance between acknowledging the urgency of adopting the technologies to improve healthcare system and recognizing the challenges that may follow such implementations [26]. In the same vein, lack of systematic records management has been linked to the persistence of data corruption [27] and there is problem of inadequate health information management systems in developing nations [28]. Apparently, contemporary issues in health information management practice and healthcare systems management in Nigeria are capable of provoking the immediate adoption and implementation of HIT in order to revolutionize the moribund systems. For instance, most healthcare settings in Nigeria are predominantly on paper-based health information systems [29]; clinical documentation in the prevailing manual system has been reported to be suboptimal [30] and providers have been reported [31, 29 and 32] to lack the right computing skills relative to their responsibilities. However, other studies from Nigeria demonstrate that healthcare providers believe in the efficacy of HIT in enhancing medical confidentiality [33] and that providers now use computer and the Internet to enhance their professionalism and improve healthcare quality [34].

Over the years, the Nigerian Government developed a 5-year Strategic plan on health and of the six building blocks of achieving the goals, health information system takes a strategic position. The goal is to provide an effective National Health Management Information System (NHMIS) by all the governments of the Federation to be used as a management tool for informed decision making at all levels and for improved healthcare [35]. In furtherance of her efforts to achieve the plan, the Government recognized the need to have a harmonized health information management through HIT. It was on this premise that the first National Conference on HIT was organized by the Federal Ministry of Health between November 2 and 4, 2011 (see Fig 1). The

focus of the conference was to have one harmonized health data management system and the specific objectives were to compile a list of health information system applications in use in the country, to review the interoperability of the existing systems, to review the HIT components of the country's ehealth strategies and to propose strategies for the establishments of interoperability standards and capacity building. Subsequently, the National Council on Health in August 2013 approved the deployment of EHRs in all the thirty six states of the federation, including the Federal Capital Territory [36].

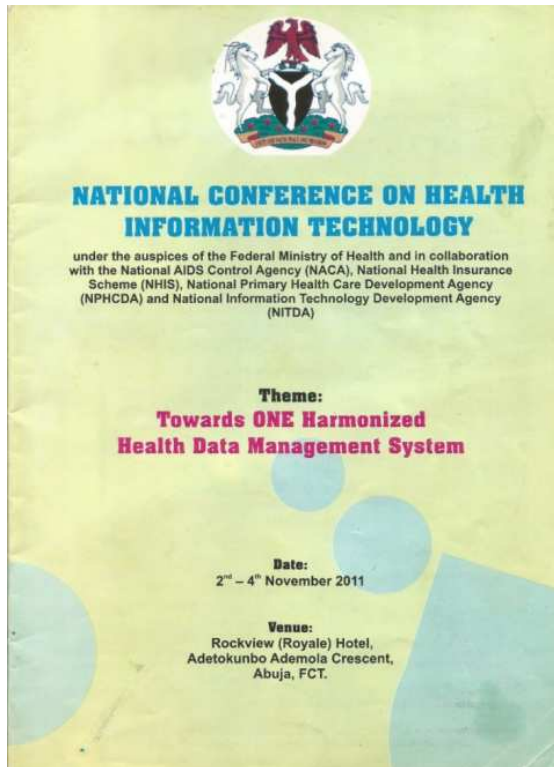


Fig 1. 1<sup>st</sup> National Conference on HIT in Nigeria, 2011

### 1.1. Aim of the Study

The associated benefits of HIT over paper-based health records systems are widely appreciated and quite obvious. However, the Nigerian healthcare system is predominantly paper-based and stakeholders would require specific advocacy for the promotion, adoption and effective implementations of HIT for optimal use and improved healthcare quality. Therefore, this study attempted to determine the perceptions of all stakeholders towards the emerging health information technology in Nigeria.

## 2. Methods

### 2.1. Background to the Study Areas

The study was carried out at two national conferences that brought relevant healthcare providers and stakeholders together in 2011 and 2014 respectively. The first was at the maiden National Conference on Health Information

Technology organized by the Federal Ministry of Health in collaboration with some government agencies such as National AIDS Control Agency (NACA), National Health Insurance Scheme (NHIS), National Primary Health Care Development Agency (NPHCDA) and National Information Technology Development Agency (NITDA). The conference was coordinated by the Foundation for Sustainable Health Development (FSHD) at the Rockview Royale Hotel Abuja FCT. This was held between 2<sup>nd</sup> and 4<sup>th</sup> of November 2011. The second conference was the 15<sup>th</sup> National Scientific Conference of the Islamic Medical Association of Nigeria (IMAN) held between 12<sup>th</sup> and 15<sup>th</sup> June 2014 at the Justice Idris Legbo Kutigi International Conference Centre, opposite Government House, Minna Niger State Nigeria.

### 2.2. Study Design

This is a cross-sectional survey of healthcare stakeholders on the emerging HIT.

### 2.3. Study Population

Participants in this study include healthcare professionals (such as doctors, nurses, HIM professionals and so on) and other practitioners who by the virtue of their workplace, contribute to healthcare services delivery (such as IT professionals, administrators, planners and so on).

### 2.4. Data Collection Tools

A 25-point questionnaire on the subject was administered on the conference attendees who so agreed to participate in the study.

### 2.5. Sampling Techniques and Sample Size

A convenience sample, randomly selected from the conference attendees in 2011 and 2014 was recruited for the study. A total of 233 gave their consent for participation.

### 2.6. Inclusion and Exclusion Criteria

In spite of the wide gap between the two conferences (2011 and 2014), participants were restricted only to conference attendees.

### 2.7. Data analysis and Management

The Statistical Software (SPSS 16.0 for window) was used to analyze the data. Chi square and Cramer's V were computed for the nominal by nominal variables and *p*-value for statistical significance was set at 0.05. Simple percentage was also computed for succinct descriptions.

### 2.8. Ethics

Informed consent was clearly worded on the page before the questionnaire to obtain participants' consent. Permission to administer the instrument was granted by the head of the coordinating body (FSHD) at the 1<sup>st</sup> National Conference on HIT in 2011 and the National Secretary of IMAN gave the pass at the second venue in Minna Nigeria.

### 3. Result

#### 3.1. Participants' Profile

*Table 1. Professional inclinations of participants*

	Frequency	Percent
Health Information Management	65	27.9
Nursing	41	17.6
Information Technology	27	11.6
Medicine & Surgery	21	9.0
Pharmacy	11	4.7
Medical Laboratory Science	10	4.3
Secretariat/Administration	6	2.6
Community/Environmental Health	5	2.1
Accounting/Banking	4	1.7
Others	43	18.5
	233	100

*Table 2. Spread of participants' workplace*

Facilities	Frequency	Percent
Tertiary healthcare facilities	117	50.2
Secondary/state specialist hospitals	30	12.9
Non-governmental organizations	14	6.0
States ministry of health/hospital management boards	10	4.3
Training institutions/school health centres	10	4.3
Primary healthcare centres	7	3.0
Federal Ministry of Health	4	1.7
Regulatory bodies/health agencies	4	1.7
Private organizations	3	1.3
Intra Health, USA	3	1.3
Others	31	13.3
	233	100
<i>Geographical location of workplace</i>		
North-central, Nigeria	91	39.1
North-west, Nigeria	53	22.7
North-east, Nigeria	26	11.2
South-west, Nigeria	21	9.0
South-east, Nigeria	7	3.0
International partner (USA)	3	1.3
South-south, Nigeria	1	0.4
Others (location not specified)	31	13.3
	233	100

At the two conferences, 233 participants completed and returned the questionnaires, 76% of whom were male professionals. Table 1 that follows shows that more than a

quarter (65, 27.9%) of participants were HIM professionals. This was distantly followed by nurses (41, 17.6%) and IT practitioners (27, 11.6%). Table 2 presents participants' workplace and further illustrates geographical locations of their workplace. Half of the participants came from tertiary health institutions and it is important to note that a number (3, 1.3%) of them came from the United State of America to the 1<sup>st</sup> National Conference on HIT. Table 2 also shows that the spread of participants' workplace across Nigeria depicts that two in every five of the participants worked in North-central Nigeria.

#### 3.2. Attitude Toward Health Information Technology

Most participants (181, 77.8%) own laptop computers and some of them (78, 43.1%) brought it to the venue of the conference while financial constrains remain the major (18, 34.6%) reason some participants could not have one. A simple majority (159, 68.2%) utilized the Internet daily while a higher portion (171, 73.4%) possess email address and nearly one-fifth (22, 19.8%) of the participants came from facilities with full computerization of processes. The most frequently suggested solution or action (107, 60.8) to be taken on paper records in the wake of HIT is to archive them and this was distantly followed by electronic back up (30, 17.0%).

#### 3.3. Participants' Opinions of the Emerging Health Information Technology

Table 3 below shows that the majority (226, 99.1%) of participants admitted that HIT will improve communication among healthcare providers while a half of them (114, 51.6%) argued that HIT goes beyond being just a replica of the traditional medical record systems. More than two-third (151, 66.8%) of the participants were optimistic that holistic and seamless paperless health records systems is feasible in Nigeria and nearly the same portion of them (139, 62.6%) believed that nationwide implementation of HIT is possible by the year 2020.

*Table 3. Perceptions of the emerging HIT*

	N	Yes/True	No/false/unsure	% in favour of HIT
Holistic paperless health records systems is possible in Nigeria	226	151	82	66.8
HIT will facilitate prompt retrieval of patients' health records	227	223	4	98.2
HIT will improve communication among healthcare providers	228	226	2	99.1
HIT will enhance confidentiality of the protected health information	227	207	20	91.2
HIT will improve the quality of medical care	228	224	4	98.2
HIT will save hospitals the cost of paper stationery	229	216	13	94.3
HIT will lead to retrenchment of hospital staff	227	75	152	67.0
HIT will dehumanize patient-doctor relationship	220	48	172	78.2
HIT will pose threats to patient's privacy	224	77	147	65.6
Misfiling and mislaying of patients' health records will be laid to rest in the wake of HIT	226	149	77	65.9
HIT is the electronic replica of the traditional health records management	221	107	114	51.6
Feasibility of HIT in Nigeria by year 2020	222	139	83	62.6

### 3.4. Factors Associated with Opinions on Health Information Technology

Factors associated with participants' opinions of the emerging HIT are highlighted in Table 4. Essentially, sex, profession and workplace contributed a lot to how participants viewed the workability and the potential benefits of HIT in Nigeria. The most significantly influencing factor

is sex and it is the only factor that affects participants' optimism about the feasibility of a paperless healthcare system in Nigeria ( $p=0.010$ ) and frequent utilization of the Internet ( $p=0.001$ ). All the trio of sex, profession and workplace are associated with stakeholders' opinion that the evolving HIT is capable of improving medical care quality ( $p=0.059$ ;  $0.000$ ;  $0.014$ ) of the Nigerian populace.

Table 4. Association between variables and participants' opinions of HIT

	Chi square ( $\chi^2$ )	Cramer V ( $\phi_c$ )	df*	p-value
<i>Sex set against opinions</i>				
Frequent utilization of the Internet	19.668	0.291	4	0.001
Holistic paperless health records systems is possible in Nigeria	11.249	0.220	3	0.010
HIT will enhance confidentiality of the protected health information	0.474	0.045	2	0.789
HIT will improve the quality of medical care	5.660	0.156	2	0.059
HIT will dehumanize patient-doctor relationship	5.668	0.156	2	0.059
Misfiling and mislaying of patients' health records will be laid to rest in the wake of HIT	6.242	0.164	3	0.100
<i>Profession set against opinions</i>				
Frequent utilization of the Internet	3.633	0.624	352	0.327
Holistic paperless health records systems is possible in Nigeria	2.824	0.636	264	0.209
HIT will enhance confidentiality of the protected health information	2.329	0.707	176	0.003
HIT will improve the quality of medical care	3.245	0.835	176	0.000
HIT will dehumanize patient-doctor relationship	1.725	0.608	176	0.561
Misfiling and mislaying of patients' health records will be laid to rest in the wake of HIT	3.404	0.698	264	0.001
<i>Workplace set against opinions</i>				
Frequent utilization of the Internet	6.625	0.843	660	0.465
Holistic paperless health records systems is possible in Nigeria	5.155	0.859	495	0.253
HIT will enhance confidentiality of the protected health information	4.088	0.937	330	0.002
HIT will improve the quality of medical care	3.889	0.914	330	0.014
HIT will dehumanize patient-doctor relationship	3.485	0.865	330	0.232
Misfiling and mislaying of patients' health records will be laid to rest in the wake of HIT	5.374	0.877	495	0.091

\*df = degree of freedom

## 4. Discussion

Health information technology otherwise known as digitization and globalization of healthcare systems has been advanced [34] to have the potentials to speed up the required transformation of the Nigerian healthcare systems and revolutionize the provider-consumer relationship. Other studies [37, 26] further corroborated this assertion that the use of HITs will support better care of patients; enhance decision making process and patients' outcome and subsequent meaningful use. When patients experience the gains of HITs, they will demand nothing less from their providers [26]. HIT has tremendous potentials to transform how healthcare is delivered and this present survey of the Nigerian healthcare system holds promises to achieve better care in the wake of HIT.

Many researches on HIT often focus on IT design and implementations but perhaps not on perceptions of healthcare providers whereas, there is more to HIT success than IT designs and systems procurement. In spite of the advancement and benefits of HIT, studies [38] have shown that there is little evidence pointing to the ability of healthcare providers to communicate effectively. It is feeble to assume that any use of the technology is better than no use at all [39]. This brings about the technological slogan of *garbage-in-garbage-out*, the fact that computer cannot operate itself [29] and the need to improve reported

inadequacies in clinical documentation [30]. Meaningful use of HIT has been advocated [25-26] as against mere procurement and implementations of the technology. As such, the view and readiness of end-users of the technology therefore becomes paramount. In line with this, our study reveals a reasonable part of the stakeholders in Nigeria admitted that the technology promises to; improve communication among providers (99%), improve medical quality (98%), enhance medical confidentiality (91%), not to dehumanize doctor-patient relationship (78%), reduce misfiling and mislaying of patient's health records (66%) and above all, 63% of them believed that nationwide implementation of HIT is possible in Nigeria by the year 2020. Though studies [40, 4] reported that HIT portends significant risks to both the care giver and the patients, outcomes of our study are analogous to reports from researchers such as Classen et al [41] and Adeleke et al [29] where the technology is seen as having potentials to improve medical care safety and quality; Adeleke et al [29] and Adeleke et al [33] establishing findings that the technology possesses the potentials to enhance medical confidentiality than paper-based health records; and Adeleke et al [29] that HIT will not dehumanize doctor-patient relationship.

The demographic patterns of participants in this study precipitate a new order compared to the situation in developed nations. In the United States of America and Australia for instance, women mostly occupy key roles in

healthcare information systems and HIT. However, this current study shows a changing trend in responsibilities as more male (68%) HIM professionals participated in the efforts to bring about HIT in Nigeria than their female counterparts (32%). Generally, more male healthcare professionals participated in this effort. For instance, 73% of males as against 54% of females used the Internet frequently; 67% of males as against 60% of females were optimistic of paperless health records systems; and 97% of male as against 93% of females believed HIT will improve the quality of medical care. Statistically, sex is found to be the most associative factor to opinions on HIT. This finding on gender influence is congruent to other studies where females exhibited more negative attitudes towards computers and the Internet than men [42] and where males rather than their females had previously played online games [43].

This discovery is another breakthrough pointing to the fact that unlike their female counterparts, male healthcare providers in Nigeria go beyond just their primary professional obligations for the enhancement of their career. Earlier study [31] on research behaviour equally established that males are better than females in terms of investigative healthcare. Similarly, profession ( $p = 0.000$ ) and workplace ( $p = 0.002$ ) were significantly associated with perceptions of health IT. Clear evidence of this include the use of internet with 82% of IT practitioners and 51% of HIM professionals using it daily; and positive impact of HIT on medical confidentiality with highest percentage (94%) among HIM professionals and lowest at 70% among medical laboratory scientists. This finding goes with reports in studies such as Adeleke et al [34] and Bello et al [32] where profession was a factor on how people used computer and the Internet.

The level of preparedness for the adoption and effective implementations of HIT is encouraging as this study has shown an enormous improvement on previous studies from Nigeria. For instance, our study shows that 78% of participants possessed personal laptop computer as against 64% in Adeleke et al [29], 68% utilized the Internet daily and 73% possessed email address as against 50% and 58% respectively, in a recent study [34]. One-fifth (20%) of the participants as against 8% reported by Adeleke et al [29] came from facilities with full computerization of processes. More than half of the participants (52%) agreed that HIT goes beyond being just a replica of the traditional medical record systems. Hoffman & Podgurski [39] similarly argued that the functionality of comprehensive EHRs systems goes far beyond the traditional role of paper medical records. Statistically, possession of laptop is associated ( $p = 0.048$ ) with the belief that HIT will improve medical care quality; frequent use of the Internet is associated with ability of HIT to facilitate prompt retrieval of patient's records ( $p = 0.006$ ) and save cost ( $p = 0.000$ ). Similarly, belonging to a facility with some level of computerization is associated ( $p = 0.000$ ) with an optimism that achieving HIT by the year 2020 is realistic. Contrary to our findings, Aaronson et al [44] reported that prior experience with computer had no association with satisfaction with EHRs. However, other

studies in accord with our findings elucidate that increase computer experience influenced positive attitude, and perceived usefulness of HIT among healthcare providers [40, 45-46].

Recommendations on what should be done to paper-based health records post implementation of HIT include holistic archiving for the purpose of references (61%), electronic back up (17%). However, a significant portion (14%) advocated the destruction of such records in order to facilitate holistic paperless system. This calls for concern as no nation has attained 100% level of country-wide holistic paperless healthcare systems [9, 47]. As such, opting for the destruction of paper-based health records may be inimical to meaningful use and produce negative effects on public health. Intensive advocacy is therefore required reorient many Nigerian stakeholders about the emerging technology. To effectively implement HIT for a meaningful use and improved healthcare, studies [41, 48] have recommended financial incentives and eventual penalties to defaulting individual providers and health facility.

#### 4.1. Study Limitations

There was a wide gap between 2011 and 2014 for the field work due to the quest to wait for another gathering of all stakeholders nationwide. This might have influenced certain improvement in attitude toward, and opinions about HIT among participants.

## 5. Conclusion

The Nigerian healthcare system is manned by providers and stakeholders who are quite abreast of the benefits of HIT and are willing to embrace the technology in their workflow. These healthcare providers exhibited readiness to adopt the technology and the government as well is positively disposed to the nationwide implementations of the emerging technology. Practically, this is quite reassuring and may prompt the healthcare decision makers to proactively formulate policies and introduce interventions to encourage nationwide acceptance of HIT. However, there is more to be done on appropriate clinical documentation in order to set a friendly pedestal for effective takeoff, successful implementations and meaningful use of the technology. For better appreciation of Government plans on HIT, the National Conference on HIT should be convened annually and a technical committee be set up to appraise future implementations.

## Recommendations

- i. Nationwide advocacy on the need to adopt Health IT
- ii. Continuing professional and IT education for all stakeholders
- iii. Establishment of clinical documentation improvement committee in health facilities, such that will ensure data quality and appropriate clinical documentation.
- iv. Encouragement of local content software development

- v. Appropriate funding of the project and introduction of financial incentive to facilities that improve healthcare quality through HIT adoption, implementations and meaningful use.

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