天主教輔仁大學英國語文學系學士班畢業成果
ENGLISH DEPARTMENT, FU JEN CATHOLIC UNIVERSITY
GRADUATION PROJECT 2017

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Cloud-based Electronic Medical Record

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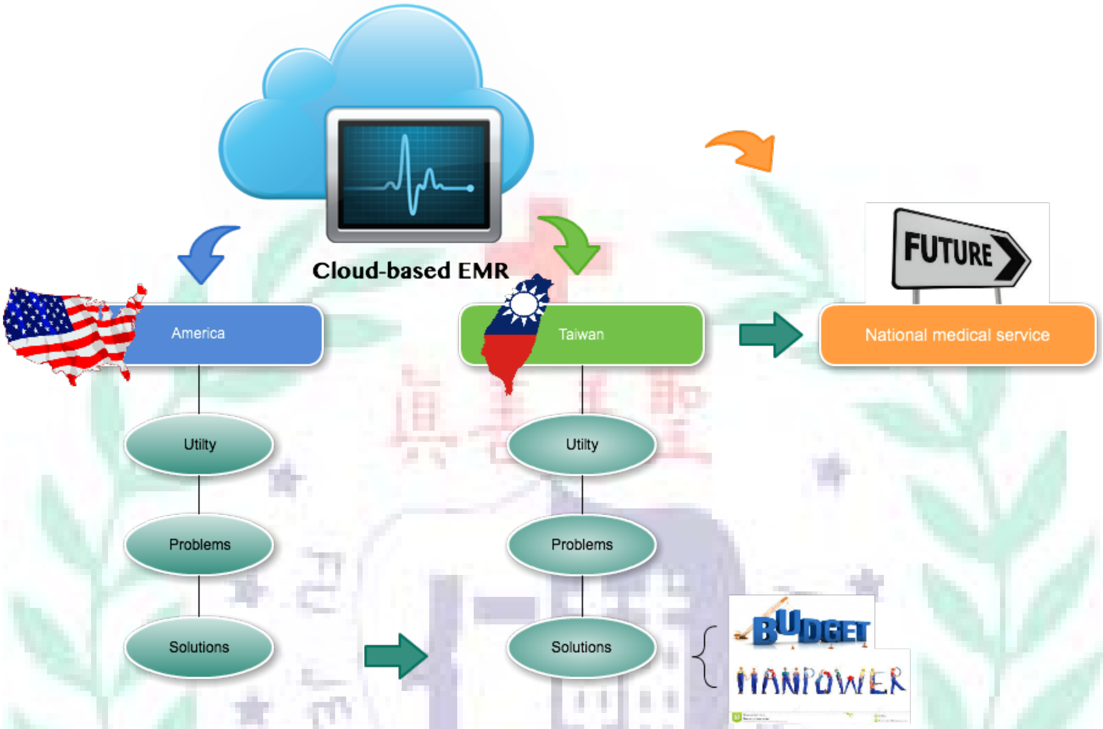
Technology-Assisted Instruction & Presentation

Junior

Cloud-based Electronic Medical Record



This is the outline of our project. It is created by the software, Cacoo.

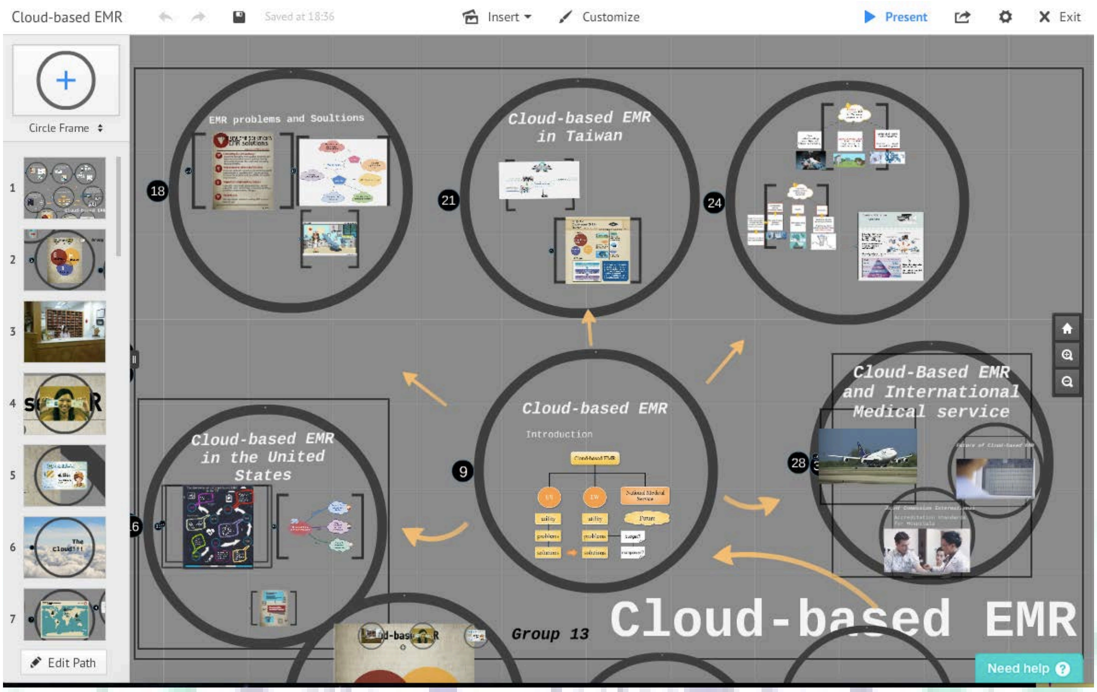
Final project:

Promoting cloud based loud-based electronic medical record is our major goal, since cloud based EMR is not only an advanced system to improve the interaction between patient and hospital, but also a preparatory stage for international medical service. Although Taiwan has already started the cloud-based EMR project, but comparing to other developed countries, Taiwan's medical system still has a long way to go. Using USA as a role model, we try to find out the advantages and problems of cloud-based EMR; by doing so, Taiwan will be well-prepared when encountering the problems of developing the cloud-based.

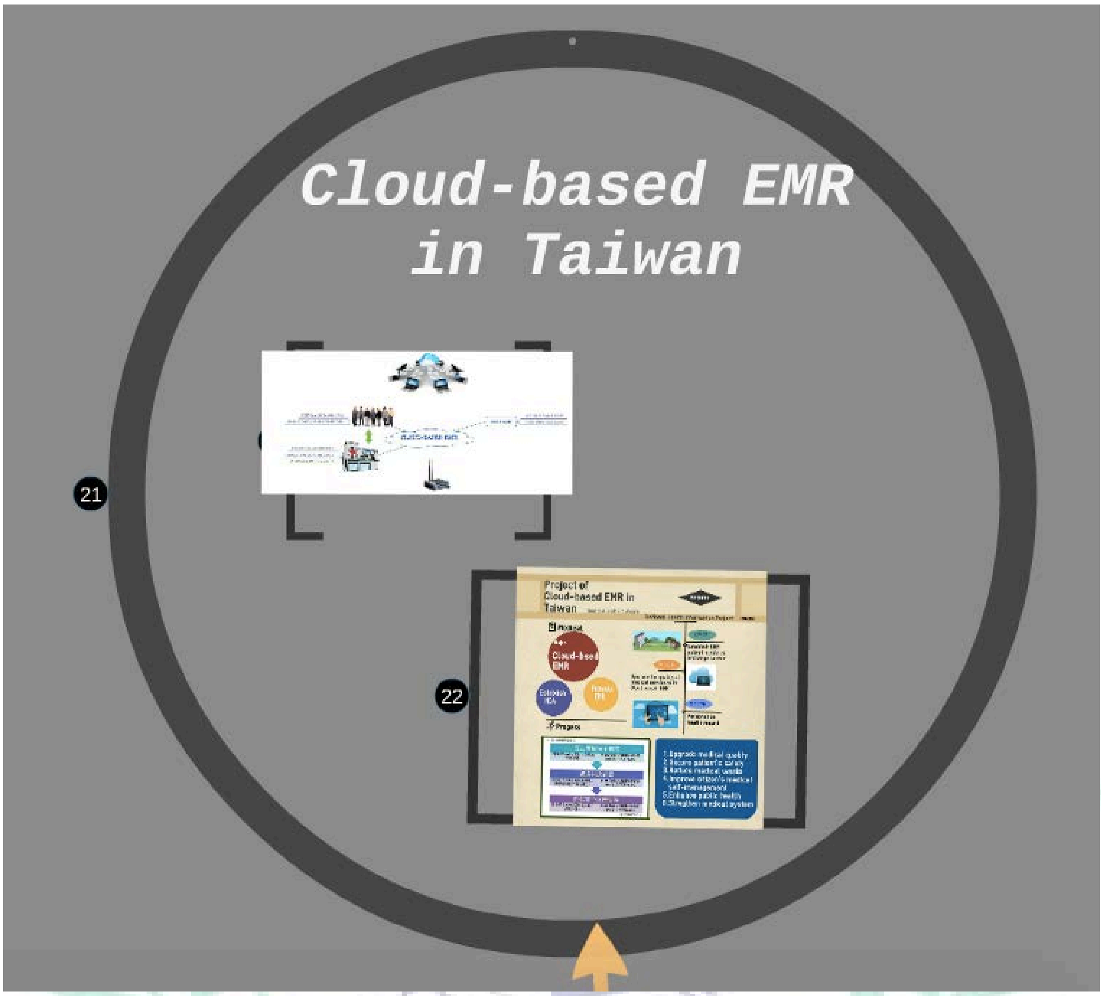
Group presentation:

Prezi link:

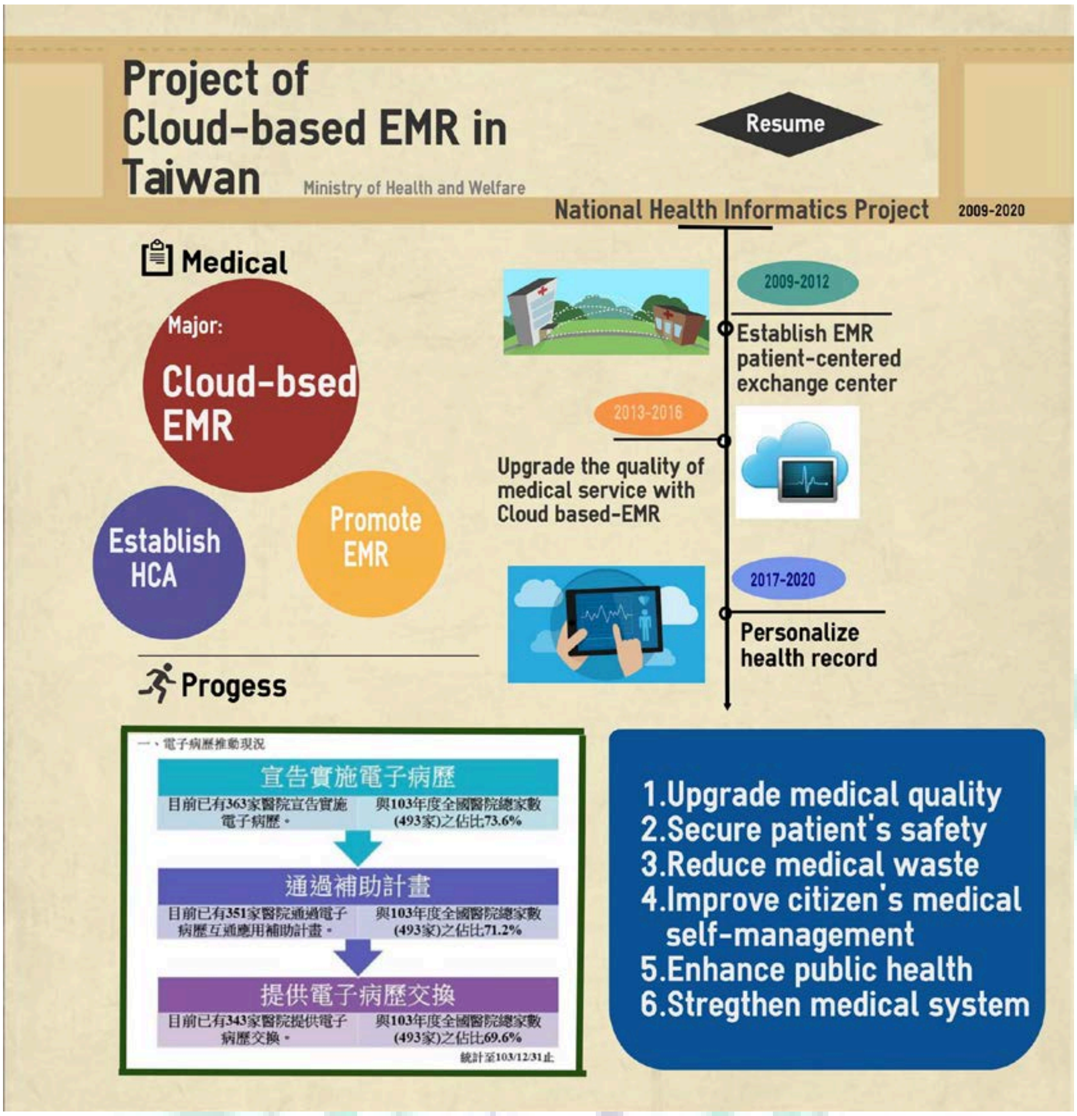
https://prezi.com/0qrwpwjshvvn/edit/?utm_campaign=share&utm_medium=email


Cloud-based EMR
Saved at 18:36
Insert
Customize
Present
Exit
Circle Frame
Edit Path
EMR problems and Soultions
Cloud-based EMR in Taiwan
Cloud-based EMR
Introduction
Cloud-based EMR in the United States
Cloud-Based EMR and International Medical service
Group 13
Cloud-based EMR
Need help

We used Prezi to present our work, instead of Power point


Cloud-based EMR in Taiwan
21
22
Project of Cloud-based EHR in Taiwan
Cloud-based EMR
Progress
1. Upgrade medical quality
2. Secure patient's safety
3. Reduce medical waste
4. Improve citizen's medical self-management
5. Enhance public health
6. Strengthen medical system

I was in charge of Taiwan’s use and progress of Cloud-based electronic medical record. I used Cacoo, Xmind and Easelly to make the diagram, and present them with Prezi.



Project of Cloud-based EMR in Taiwan

Ministry of Health and Welfare

Resume

National Health Informatics Project 2009-2020

Medical

Major: Cloud-bsed EMR

Establish HCA

Promote EMR

2009-2012

Establish EMR patient-centered exchange center

2013-2016

Upgrade the quality of medical service with Cloud based-EMR

2017-2020

Personalize health record

Progess

一、電子病歷推動現況

宣告實施電子病歷

目前已有363家醫院宣告實施電子病歷。	與103年度全國醫院總家數(493家)之佔比73.6%

通過補助計畫

目前已有351家醫院通過電子病歷互通應用補助計畫。	與103年度全國醫院總家數(493家)之佔比71.2%

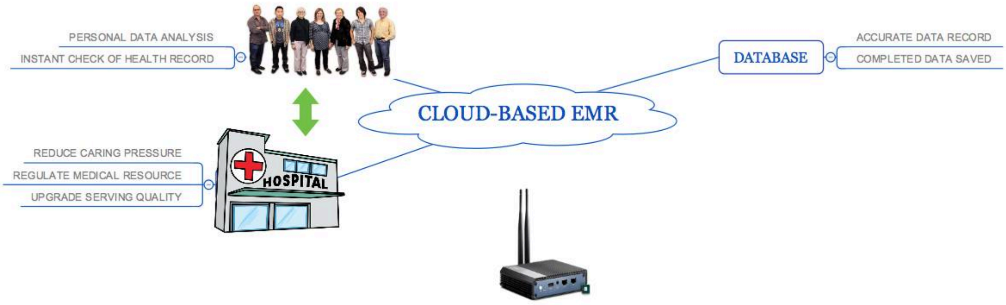
提供電子病歷交換

目前已有343家醫院提供電子病歷交換。	與103年度全國醫院總家數(493家)之佔比69.6%

統計至103/12/31止

1.Upgrade medical quality
2.Secure patient's safety
3.Reduce medical waste
4.Improve citizen's medical self-management
5.Enhance public health
6.Stregthen medical system

I used Easelly to make this diagram. In this diagram, I talked about the project of Cloud-based EMR in Taiwan (Goals, plan and progress).



I used Xmind and Cacoo to create this diagram. Since I can't use Xmind to insert pictures, I screenshot the diagram first made by Xmind, and then use Cacoo to complete it (insert pictures).

My role in our group:

In the group, I try to provide ideas to my teammates, and I would summarize the ideas we've develop to make sure we were on the right track. I also acted as advisor in the group. Since my father is a doctor, he can provide accurate answers to out questions, for instance, the current situation or plan of medical system. As for the project, I was in charge of Tawian's progress and history of EMR.

Semester reflection:

	2	2. Today, I learned how to cut down my PPT slides, and I found it very useful. It's important to delete things which are unnecessary, since it's easy for me to keep on adding things. I'll try to make my PPT more concise next time; Also, I'll avoid too much decoration, and design my PPT into a clearer one!
Oct.	3	I've learned a new software- Easelly. It's quite interesting, at first I thought it is similar to Prezi, butn it's not so alike actually. Animation is not required in Easelly, however, there will be less problem since there is not required of internet.
	4	Today, I learned how to use Easelly. It's really annoying when I have to use a whole new software, something stupid will happen, and I have to ask stupid questions. However, I like this software since these design of the posters are really effective and colorful. I hope I can get used to it as soon as possible, and to make use of it in my assignments!
	5	Never thought so much about our ican system, it's amazing to know that LMS system had combine so much functions in one software. Our group had discussed about the flexibility of learner in LMS, and we found out a specific example. Without the LMS, it hard for us to upload the revised file, we had to find teacher, TA to hand in new file. But now, student can re-upload our revise file really Easelly at home. just simply delete the original one and

		upload the new one. This really make learning more simple and it encourage student s to improve their works!
	6	Today I suffered a lot from using Moodle, I felt like I'm getting insane and totally pissed off by it. In fact, I'm never good at using any computer-related things, I think that's why I'm so frustrated while starting a new software. However, I indeed got more familiar with Moodle, it's really different from ican. Moodle had a lot of functions which ican didn't include, but in away, I think it become too complicated for new started to use; in fact, I think the whole is confused!
	7	1. Today, we learned how to use Xmind. In fact, I kind of like this software, since I like to brain storm a lot before I start to write my essays. I really don't like to write proper outline, since it requires accurate format, and it's hard to think of something new under this kind of strict format. While, Xmind is free, it follows people mind flow, which is random and spontaneous. Therefore, you can think of anything in your mind without being restrict. During the process of comparing two singers, I found out that different format of comparison makes huge differences. For instance, the blank form is good for people to start with, since at the beginning ideas often just pop out messily without clear logic. While, the form format, is not good for the beginning but at the end when people have the conclusion, in a word, since it's clear and easy to understand, form is good for rapping up one's work. However, I really enjoy today's class! And I will keep using this software in my future.
Nov.	8	Today, we learn 2 software, 百萬大歌星 and Audacity. The former one is funny, we had a lot of fun in the class, but I think its' only for entertainment so I probably won't have the chance to use it in my future. However, the later one is interesting, since it's quite simple and useful. In fact, we just use it for our CC mini play at Friday! Although the group spent too much time on their presentation, I really appreciate their effort on explaining details of using the software. In my opinion, it's better to spend more time to teach us than to rush through it. I like their presentation a lot, since I had learned a lot form it.
	9	I've learned a new software- Easelly. It's quite interesting, at first I thought it is similar to Prezi, but it's not so alike actually. Animation is not required in Easelly, however, there will be less problem since there is not required of internet.

	10	Today I've learned some spelling games from the other groups, which are interesting and useful for English learners. Since many students consider memorizing vocabulary a boring process, those games can help them a lot. I also learned some positive and negative affects which games will bring to us, in my opinion, not only play games will make us stupid, watching TV can also leads to the same consequences. However, it is hard for some of us to quit playing games, therefore, it will be better for us to change playing games into a positive activity, so people can enjoy the games as will as enhance skills or abilities.
	11	Holiday
Dec.	12	We've reflected on the lessons we learned last class, playing different games affects people in different ways, some bring negative effects to our brain, but some can bring positive effects in learning skills. Today, our group teach the class a software, orange light, which is used to produce games. However, we encountered some technical problems, so our classmates couldn't download it. We're really sorry about this problem. In fact, technology is very convenient but many accidents will happen while we use them. Sometimes it’ s really frustrating. In a word, we need to prepare backup plan, instead of totally rely on tech!
	13	Today each of the groups has to briefly explained their final projects, and most of the groups presented with their cacoo. I found some of their diagram very clear and beautiful. For example, I like the diagram which divides different category with different colors, it's very clear to me. Also, the one which use Frozen as background is beautiful, and at the same time it doesn't distract the main points on the diagram. Today we learned what creative common is, it's a very convenient way to show the copy rights of the original work. As for the author, he or she can protect the work by setting the basic requirement to people who want to use the work. As for the users of the work, they will be able to know the basic requirement of using the work, therefore, they can use the original work without afraid of violating the copy rights. It's good that both the author and the user can have mutual understand of the copy rights and the requirement of sharing the work. Creative commons is especially good for educational use. Today we also have to work on our Evercam, but since I haven't finished my work, I did not do a lot things in the third period of class.

		Reading reflection: 1. It's the end of the article. 2. I have attribute the work to the author, also, I can't use it for commercial use. 3. The author did not agree that Creative Common is able to solve every problems about copy rights. Yet the author believe that Creative Common "fulfills our dual needs to maintain the rights of individual participants while sharing history with the public." Evercam reflection: It took more time than I thought. Since I didn't write down a script, I had to pause and restart for many times. At first I thought the process will be faster without a script, but it turned out that I spent even more time editing. Evercam is not hard to learned, nor to understand, I didn't encounter a lot of technical problem except it unexpectedly quit for 3 times when I was editing (not few in fact). I uploaded it onto YouTube quite smoothly. However, I still felt exposed to the public although I had set the video private. Since the including stuff is very private, I prefer not to unload it to a public site. Suppose we can skip this process next time? Besides from that, Evercam is a very useful tool to use. YouTube link: https://www.youtube.com/watch?v=xrv4LasyMZI&feature=youtu.be	
	14	We have some problems with our topic, so we are kind of nervous this week. The original assumption (working hypothesis) is wrong, so I had to change our direction and goal of the topic. At first, we thought Taiwan wasn't trying hard to promote cloud-based EMR, so we want to see if Taiwan should promote it or not. However, we later found out Taiwan, in fact, had already promoted this system in 2008. So we reset the topic, to see how Taiwan can improve the system.	60 (four somethi wrong)
	15	We tried to look into information and analysis it. And divide our job more clearly, two of us will be in one group (Taiwan, USA, and worldwide group). We see USA as a model for Taiwan to learned from. However, it's good we are getting out out the mess and doing better on our topic now. Hope we get to finish it!	
Jan. 2016	16	Today we listened to other group' s presentation, and we were responsible to respond to the pollution group. Their presentation is quite smooth and well-prepared. The presentation's topic (content) is very difficult, and maybe that's why their presentation was rather plain than other groups. They did well in using Xmind and Cacoo to present different kinds of chemistry' elements. However, in my opinion, I don't think they should include so much difficult terms in their presentation, since those terms means nothing to	1

		people who are not professional of chemistry, and there were several times that the group members failed to pronounce the terms correctly. But in general, I'm impressed by their difficult choice of topic.
	17	Today we listened to other group' s presentation, and we were responsible to respond to the pollution group. Their presentation is quite smooth and well-prepared. The presentation's topic (content) is very difficult, and maybe that's why their presentation was rather plain than other groups. They did well in using Xmind and Cacoo to present different kinds of chemistry' elements. However, in my opinion, I don't think they should include so much difficult terms in their presentation, since those terms means nothing to people who are not professional of chemistry, and there were several times that the group members failed to pronounce the terms correctly. But in general, I'm impressed by their difficult choice of topic. Today we were responsible to respond to the Starbucks group. Their topic was quite interesting, and they were very well-prepared. They included many different aspects of the Starbucks company. I like the localization and globalization part a lot, and was impressed by Starbuck's strategy of marketing. They not only try to explore their market all around the world, but also tries to blend in the local culture with different ways. Also, the social responsibility part is also interesting, I didn't know Starbuck has contribute to the society with so many and different way. And I think this is also a good marketing strategy (commercial), since the local people will be more willing to support their products after knowing their hard work on helping the society. I've learned a lot of new things in their presentation, and I enjoyed it a lot!
	18	I’ve learned a lot in this semester, my favorite software is Xmind. Since I’m hate to make outline, my work will be illogical; however, Xmind helps allows me to develop ideas and organize them at the same time. I really love my crazy teammates, we encountered a lot of problems during the process of final project, and all of us are busy. Yet, we still manage to get together and solve the problems. We are now more than teammate, but good friends. Thank you BC for teaching us so many helpful software, now I can use those software instead of Word and PPT!

Final reflection:

I never though this project would be so hard and so time consuming. I’ve learned a lot of things during the process. First of all, I am able to put software I’ve learned in this class into practice, and I found them very useful. Secondly, I’ve gained knowledge from a field which I’m not familiar with. I’ve learned terms and professional information form our project. Lastly, I’ve learned to cooperate with my teammates; also, to deal with pressure and frustration. Since the topic is professional and difficult, we encountered many problems and difficulties during the process. Nevertheless, we still stick to this topic and manage to solve the problems.

I’ve learned a lot of new skills in this class. Although English department is a department which relies on computer very much, it seems that since I came to our department, the only two software I can use are Word and PPT. It’s really nice that we can learned so much technical skills in our department, those skills are really useful, and I believe they will help us to be more creative in doing presentation. Thank you!

Reference list:

"Dian zi bing li jiao huan shang lu tiao zhan gao: Guan li shi quan xu tong he." *Digtimes*. Digtimes, 25 Aug. 2014. Web. 20 Dec. 2015. <http://www.digitimes.com.tw/tw/dt/n/shwnws.asp?CnlID=13&Cat=&id=390991>.

"Wei sheng shu fu li bu tui dong zhuan qu." *Wei sheng shu fu li bu tui dong zhuan qu*. Ministry of Health and Welfare, 29 Dec. 2015. Web. 10 Dec. 2015.

"Yun duan yi liao fu wu ping tai: xin bo qi ye you xian gong si." *Yun duan yi liao fu wu ping tai: xin bo qi ye you xian gong si*. Xin Bo, 2013. Web. 20 Dec. 2015. <http://xinbo58.com/goods1-89.html>.

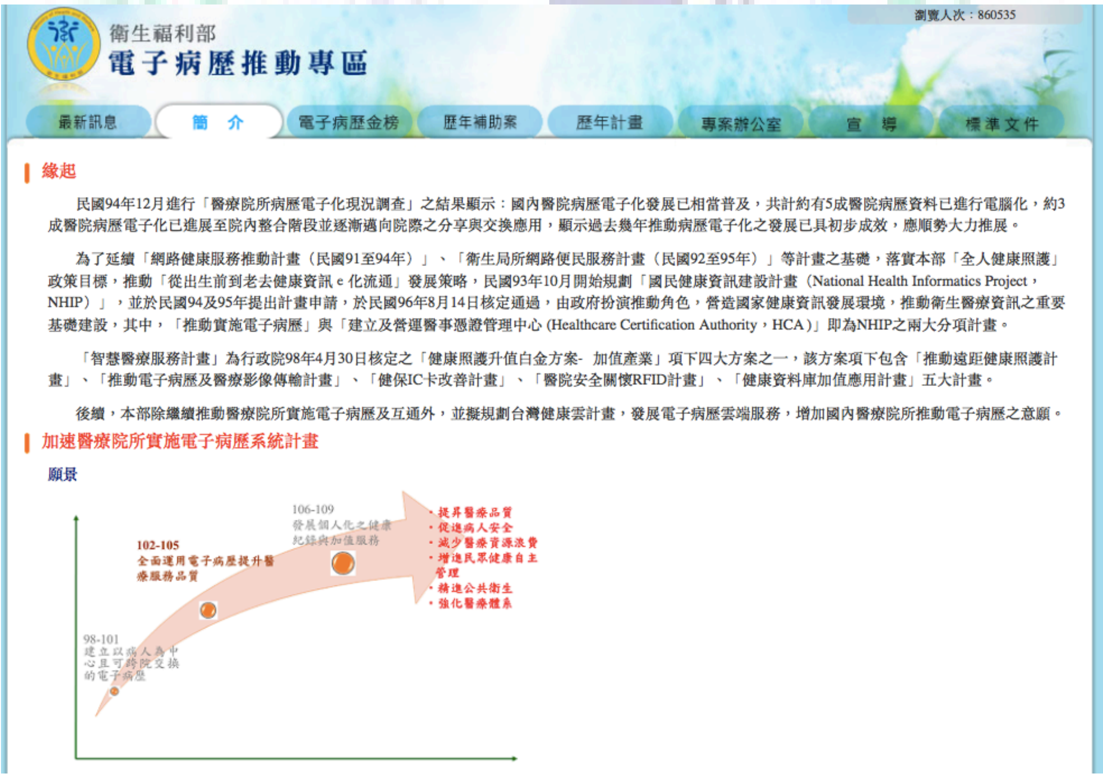
Rodrigues, Joel Jpc, Isabel De La Torre, Gonzalo Fernández, and Miguel López-Coronado. "Analysis of the Security and Privacy Requirements of Cloud-Based Electronic Health Records Systems." *J Med Internet Res Journal of Medical Internet Research* 15.8 (2013): n. pag. Web.

Link of google drive's folder:

https://drive.google.com/drive/folders/0B7jkZpUNnjmjZldiTXZDOHNkbDA

Online resource:

衛生署福利部推動專區 http://emr.mohw.gov.tw/introduction.aspx



緣起

民國94年12月進行「醫療院所病歷電子化現況調查」之結果顯示：國內醫院病歷電子化發展已相當普及，共計約有5成醫院病歷資料已進行電腦化，約3成醫院病歷電子化已進展至院內整合階段並逐漸邁向院際之分享與交換應用，顯示過去幾年推動病歷電子化之發展已具初步成效，應順勢大力推展。

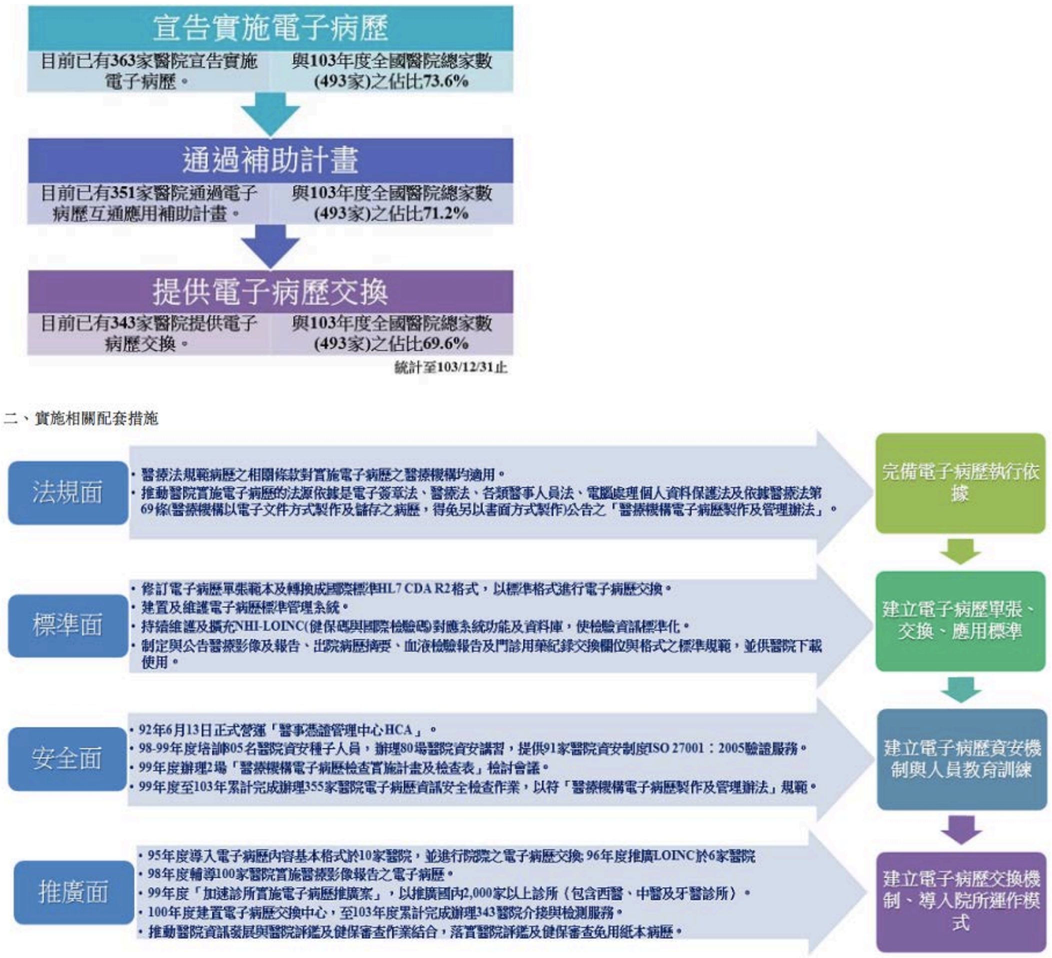
為了延續「網路健康服務推動計畫（民國91至94年）」、「衛生局所網路便民服務計畫（民國92至95年）」等計畫之基礎，落實本部「全人健康照護」政策目標，推動「從出生前到老去健康資訊 e 化流通」發展策略，民國93年10月開始規劃「國民健康資訊建設計畫（National Health Informatics Project，NHIP）」，並於民國94及95年提出計畫申請，於民國96年8月14日核定通過，由政府扮演推動角色，營造國家健康資訊發展環境，推動衛生醫療資訊之重要基礎建設，其中，「推動實施電子病歷」與「建立及營運醫事憑證管理中心 (Healthcare Certification Authority，HCA)」即為NHIP之兩大分項計畫。

「智慧醫療服務計畫」為行政院98年4月30日核定之「健康照護升值白金方案- 加值產業」項下四大方案之一，該方案項下包含「推動遠距健康照護計畫」、「推動電子病歷及醫療影像傳輸計畫」、「健保IC卡改善計畫」、「醫院安全關懷RFID計畫」、「健康資料庫加值應用計畫」五大計畫。

後續，本部除繼續推動醫療院所實施電子病歷及互通外，並擬規劃台灣健康雲計畫，發展電子病歷雲端服務，增加國內醫療院所推動電子病歷之意願。

加速醫療院所實施電子病歷系統計畫

願景



宣告實施電子病歷

目前已有363家醫院宣告實施電子病歷。 與103年度全國醫院總家數(493家)之佔比73.6%

通過補助計畫

目前已有351家醫院通過電子病歷互通應用補助計畫。 與103年度全國醫院總家數(493家)之佔比71.2%

提供電子病歷交換

目前已有343家醫院提供電子病歷交換。 與103年度全國醫院總家數(493家)之佔比69.6%

統計至103/12/31止

二、實施相關配套措施

法規面

- 醫療法規範病歷之相關條款對實施電子病歷之醫療機構均適用。
- 推動醫院實施電子病歷的法源依據是電子簽章法、醫療法、各類醫事人員法、電腦處理個人資料保護法及依據醫療法第69條(醫療機構以電子文件方式製作及儲存之病歷，得免另以書面方式製作)公告之「醫療機構電子病歷製作及管理辦法」。

完備電子病歷執行依據

標準面

- 修訂電子病歷單張範本及轉換成國際標準HL7 CDA R2格式，以標準格式進行電子病歷交換。
- 建置及維護電子病歷標準管理系統。
- 持續維護及擴充NHI-LOINC(健保碼與國際檢驗碼)對應系統功能及資料庫，使檢驗資訊標準化。
- 制定與公告醫療影像及報告、出院病歷摘要、血液檢驗報告及門診用藥紀錄交換欄位與格式之標準規範，並供醫院下載使用。

建立電子病歷單張、交換、應用標準

安全面

- 92年6月13日正式營運「醫事憑證管理中心HCA」。
- 98-99年度培訓805名醫院資安種子人員，辦理80場醫院資安講習，提供91家醫院資安制度ISO 27001：2005驗證服務。
- 99年度辦理2場「醫療機構電子病歷檢查實施計畫及檢查表」檢討會議。
- 99年度至103年累計完成辦理355家醫院電子病歷資訊安全檢查作業，以符「醫療機構電子病歷製作及管理辦法」規範。

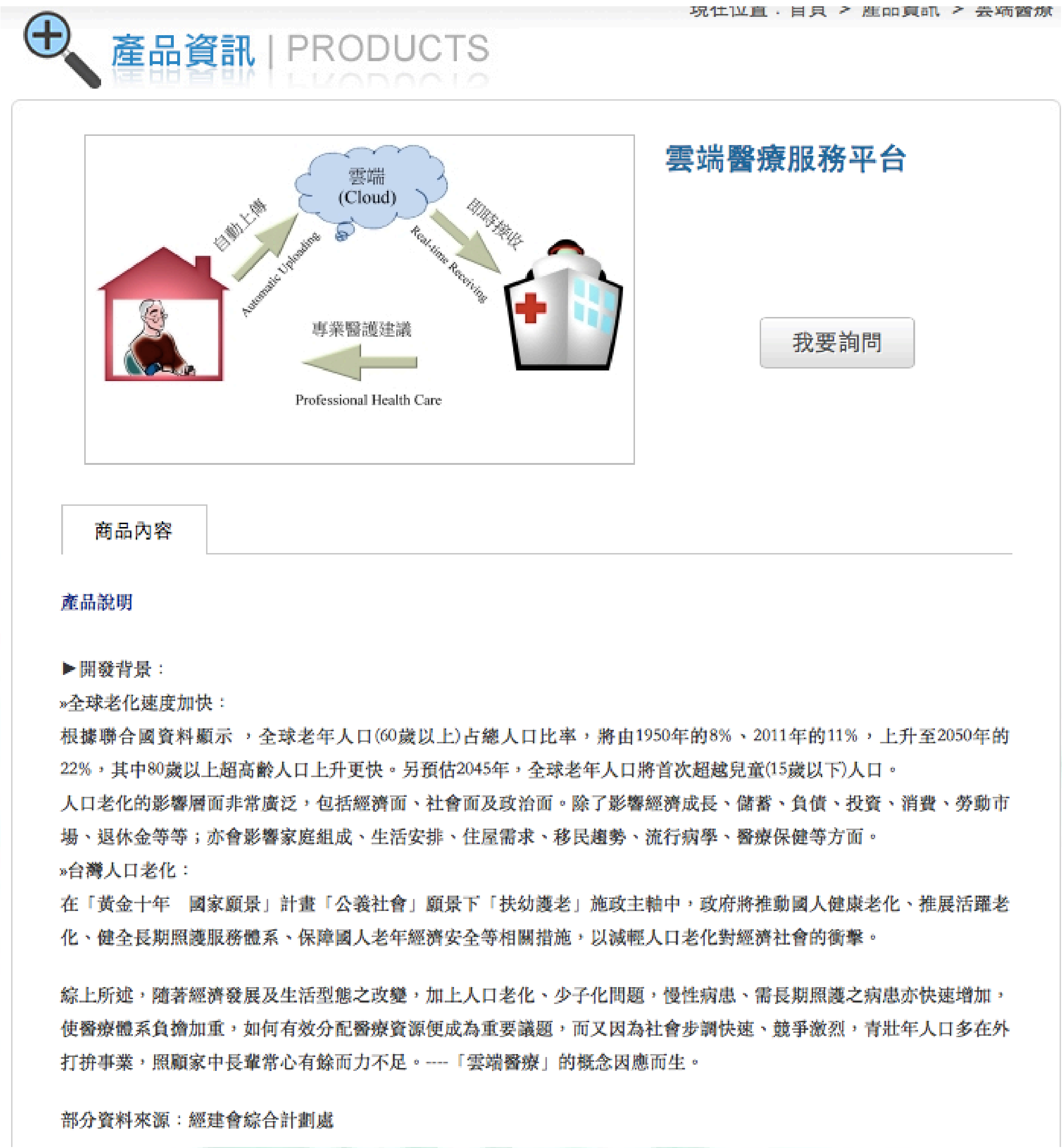
建立電子病歷資安機制與人員教育訓練

推廣面

- 95年度導入電子病歷內容基本格式於10家醫院，並進行院際之電子病歷交換; 96年度推廣LOINC於6家醫院
- 98年度輔導100家醫院實施醫療影像報告之電子病歷。
- 99年度「加速診所實施電子病歷推廣案」，以推廣國內2,000家以上診所（包含西醫、中醫及牙醫診所）。
- 100年度建置電子病歷交換中心，至103年度累計完成辦理343醫院介接與檢測服務。
- 推動醫院資訊發展與醫院評鑑及健保審查作業結合，落實醫院評鑑及健保審查免用紙本病歷。

建立電子病歷交換機制、導入院所運作模式

雲端醫療服務平台：鑫博企業有限公司 http://xinbo58.com/goods1-89.html



雲端醫療服務平台

產品說明

►開發背景：

»全球老化速度加快：

根據聯合國資料顯示 ，全球老年人口(60歲以上)占總人口比率，將由1950年的8%、2011年的11%，上升至2050年的22%，其中80歲以上超高齡人口上升更快。另預估2045年，全球老年人口將首次超越兒童(15歲以下)人口。

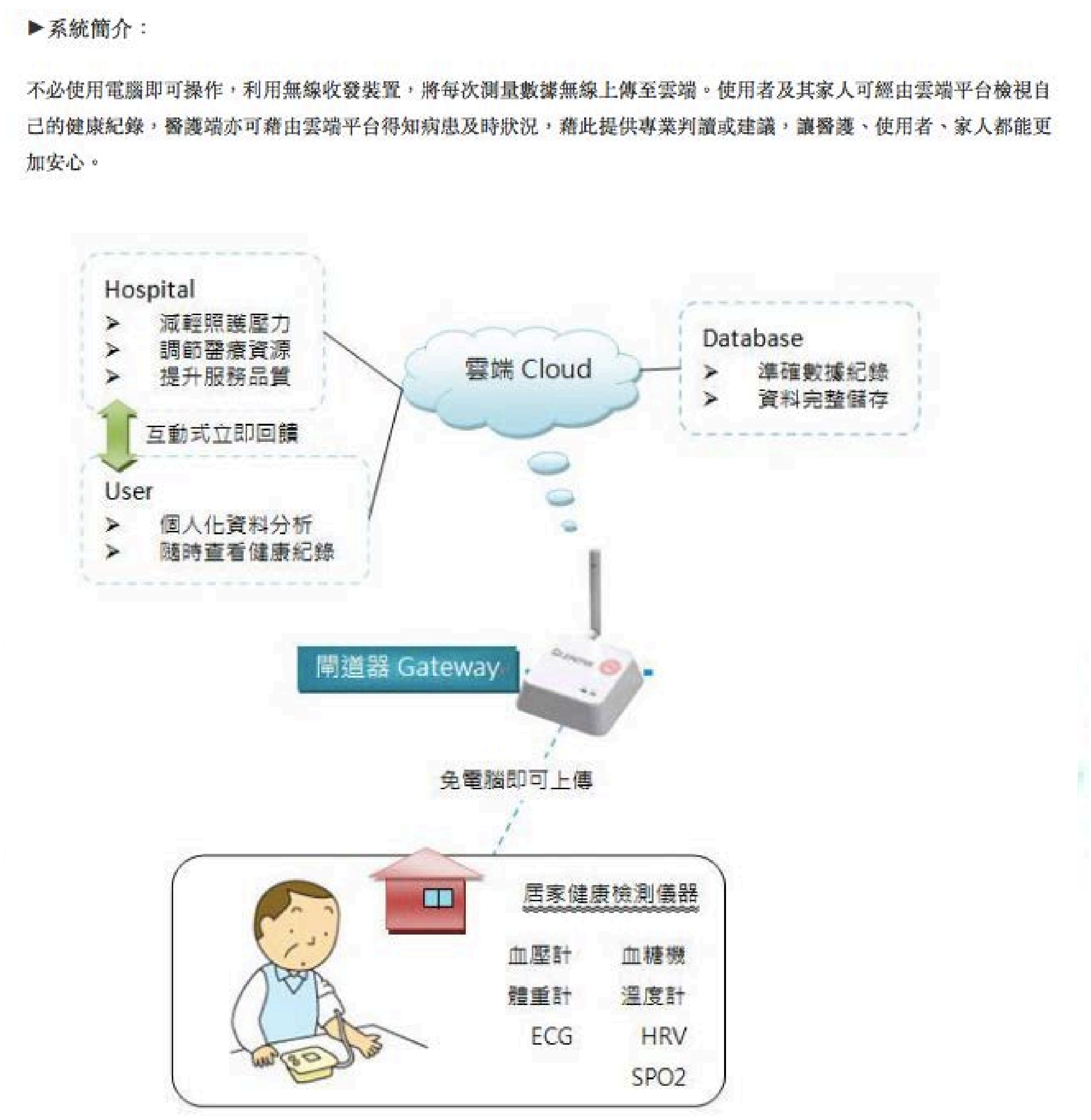
人口老化的影響層面非常廣泛，包括經濟面、社會面及政治面。除了影響經濟成長、儲蓄、負債、投資、消費、勞動市場、退休金等等；亦會影響家庭組成、生活安排、住屋需求、移民趨勢、流行病學、醫療保健等方面。

»台灣人口老化：

在「黃金十年　國家願景」計畫「公義社會」願景下「扶幼護老」施政主軸中，政府將推動國人健康老化、推展活躍老化、健全長期照護服務體系、保障國人老年經濟安全等相關措施，以減輕人口老化對經濟社會的衝擊。

綜上所述，隨著經濟發展及生活型態之改變，加上人口老化、少子化問題，慢性病患、需長期照護之病患亦快速增加，使醫療體系負擔加重，如何有效分配醫療資源便成為重要議題，而又因為社會步調快速、競爭激烈，青壯年人口多在外打拚事業，照顧家中長輩常心有餘而力不足。----「雲端醫療」的概念因應而生。

部分資料來源：經建會綜合計劃處



▶系統簡介：

不必使用電腦即可操作，利用無線收發裝置，將每次測量數據無線上傳至雲端。使用者及其家人可經由雲端平台檢視自己的健康紀錄，醫護端亦可藉由雲端平台得知病患及時狀況，藉此提供專業判讀或建議，讓醫護、使用者、家人都能更加安心。

電子病歷交換上路挑戰高 管理事權需統合
2014/08/25-DIGITIMES 企劃
DIGITIMES 中文網 原文網址: 電子病歷交換上路挑戰高 管理事權需統合
http://www.digitimes.com.tw/tw/cloud/shwnws.asp?CnlID=16&packageid=8751&id=0000390991_YRULMV9Z8JGW452QZGRFK&cat=50&ct=1#ixzz3vE034rr5

世界各國目前都已將電子病歷視為醫療服務的重要政策，如美國配合全民健保政策推動 Meaningful Use，光是 2013 年就投入 10 億美元輔助醫療資訊的提升，大陸十二五計畫投入 8,400 億人民幣推動電子病歷及技術評鑑。日本、歐盟也都已訂出了相關的進階政策。

如荷蘭在 2013 年 8 月還只有 80 萬份電子病歷交換資料，但在醫護協會(VZVZ)設立管理的荷蘭電子病歷交換系統(LSP)努力下，目前全荷蘭已有 75%的家庭醫生與 83%的藥局加入，不到一年的時間，已有超過 230 萬的荷蘭人簽署同意書，願意讓他們的電子病歷資料讓不同醫護單位如家庭醫生、藥局、醫院或其他照護組織等取得、調閱。

電子病歷交換上路困難，主要問題其實與技術關係不大，統合管理事權才是重要關鍵。DIGITIMES 攝
台灣自 2009 年起，便已著手建立電子病歷交換中心，發展至今已有相當成效。根據衛生福利部電子病歷交換中心提供的資料，目前已完成電子病歷交換建置的醫院共計 276 家。

值得注意的是，至 2012 年底，全台 500 多所醫院，其實只有 142 家連結上電子病歷交換中心，卻能在短短一年之內，迅速增加近一倍的數量，健康資訊交換第七層協定(Health Level Seven；HL7)的普及，扮演相當重要的角色。

HL7 協助電子病歷交換迅速普及

HL7 於 1987 年提出，是一個運用在交換醫療資訊上的標準，包括美國國家標準局(ANSI)與世界標準組織(ISO)都已認可為國際標準，對應到開放式系統架構(Open System Interconnection；OSI)的最高層，也就是應用層，以 CDA(Clinical Document Architecture)為標準文件的基礎架構，目前使用版本為 CDA R2。

目前全球加入 HL7 標準的會員國數量已經超過 37 個，包括歐美日及大陸等，都積極推動此項協定，成立於 2001 年的台灣 HL7 協會，也正致力於在台推廣 HL7 標準，希望讓台灣醫療服務能與國際接軌。

台灣 HL7 協會理事長顏志展表示，台灣 HL7 協會承接衛福部電子病歷專案後，策略性的善用醫院及廠商的力量，預計幾年內，即可讓全省 500 家健保特約醫院及 2 萬家診所連上電子病歷交換中心，未來民眾只要健保卡在手，經由患者本人同意及醫師授權，就能夠跨醫院、診所，完整取得病人過去的病史資料，享受優質的醫療服務。

顏志展指出，電子病歷交換能跨醫院調閱病歷，在甲醫院所做過的檢測可以分享到乙醫院，民眾跨醫院就診時，不用重新檢測，讓民眾減輕就醫的負擔，更減少醫療資源的浪費，他更進一步說，電子病歷交換除了在流行病學研究有相當的貢獻之外，也可作為健保給付的依據及醫策會管理每家醫院醫療品質的指標。

但由於仍有部分醫療院所沒有開發 HL7 編碼與解碼程式的能力，而某些醫療資訊廠商所開發的 HL7 軟體價格昂貴，也未能完全合乎標準，仍可能構成醫療資訊無法做全面性交換的阻礙。

台灣醫學資訊學會指出，未來除應採用開放式標準，且具良好互通性的 Web 平台，以解決目前各醫院因使用不同的資訊系統造成交換或整合上的困難外，系統所開發完成的軟體程式，也應以開放原始碼方式發布，供各醫院診所自行下載使用或參考，各醫院也可利用本身醫院既有的系統架構及程式語言，自行發展介面程式來連結資料庫，就可以完成 HL7 訊息產生及後續程式運作。

電子病歷交換須注重資安

由於病歷涉及病人個人隱私，甚至在全球化發展導致傳染病管理的複雜度日益增加的情況下，病歷資料甚至可能會涉及國安問題，醫療院所不僅要具備電子病歷交換機制，還必須更加重視資管及資安。

衛生福利部資訊處指出，針對病歷資料交換規劃的資安機制，首先是在健保 VPN 封閉式網路下才能使用，減少與外界接觸的可能，而在使用者認證方面，將採「雙卡認證」，必須同時通過病患健保 IC 卡與醫事人員卡，方能交換病歷；同時還要保存病患簽署的紙本同意書，以及留存 Log 紀錄，任何查看、更改病歷的行為，都會被記錄並永久保存。

至於影像交換中心，基本上只有索引資料庫，不會保留任何病歷資料，自然沒有洩露病患隱私的疑慮。

但要讓電子病歷交換機制正式上線，還需要全國 300 多家衛生所及 20,000 多家診所全部加入，而根據監察委員程仁宏、楊美鈴於 2013 年初所提出的糾正報告，已實施電子病歷的診所僅有 2,000 家，等於有 90%的診所尚未納入電子病歷交換中心體系，而全國已連結上電子病歷交換中心的醫院，實際交換的病歷數量也相當有限，不足以呈現電子病歷交換應有的效果。

事實上，台灣的電子病歷交換計畫，原來的規劃是希望能在 2014 年底正式上線，但依照目前的進度，即使延後到 2015 年，要讓全國所有醫療院所的病歷都能順利交換，絕非易事。

電子病歷交換推動困難重重

電子病歷交換上路困難，主要問題其實與技術關係不大。如當年衛生署在規劃「國民健康資訊建設計畫」(實施期程自 2007 年起至 2011 年止)的總經費本為 23.59 億元，預算卻在歷經兩次大幅刪減後，僅能動支 13.92 億元，實際可支用預算數僅為原規劃的 41%。

而攸關電子病歷交換的「加速醫療院所實施電子病歷計畫」(實施期程自 2010 年起至 2012 年止)總經費 60.4 億元，也大幅刪減為 10.512 億元，僅及原規劃預算 17.4%，不但因經費受到限縮，而影響執行進度，也導致政策目標必須配合滾動式調整變動，更影響計畫執行成效。

此外，推動電子病歷的權責單位事出多頭，如衛生署在推動電子病歷時，雖由資訊中心負責政策統籌，但卻只負責電子病歷醫院端事務，電子病歷法規研修及診所端事務，卻是由醫事處負責，而電子病歷署立醫院端，卻又劃歸醫院管理委員會(下稱醫管會，為任務編組)負責，而電子病歷的健保審查機制，則是由健保局配合執行，不但執行單位不同，而且地位平行，在缺乏資源配置的管理及協調機制下，欠缺橫向協調整合，不但導致計畫推動容易出現本位主義而各行其是，難以呈現分工合作之綜效，影響施政統合力及效能。

如醫療影像交換中心及醫療影像判讀中心，原來都是由醫管會建置管理，而醫療影像交換中心在升級為電子病歷交換中心平台後，權責就移轉至資訊中心，但電子病歷交換中心平台主機，卻仍置於醫管會機房，形成系統管理單位位於臺北市(資訊中心)，而設備卻置於南投市中興新村(醫管會)的異常現象，更因此增加管理行政成本。

也由於缺乏執行統合機制，即使是目前較有成效的醫院部分，也出現執行進度差異頗巨的問題，如署立醫院及大型醫學中心，幾已全數實施電子病歷，但其他中小型醫院的實施成效就相當有限，也間接影響診所的電子病歷建置工作。

此外，部分醫院因為健保資訊網專線頻寬不足，醫療影像傳輸費時，降低醫師使用電子病歷交換服務之意願，許多醫療院所甚至連全面無紙化、無片化的目標都尚未達成，更遑論建立電子病歷交換系統。

其他問題還包括，電子病歷交換中心主機尚乏異地備援機制，一旦遭遇系統毀損狀況，恐難維持即時提供順暢交換之服務品質，病患簽署同意書作業的電子化，醫療機構設置標準、醫院評鑑標準等相關法規，也都尚待進行配套修正。

推動電子病歷交換，攸關智慧醫療應用的推動，不管是法律面、技術面及需求面，顯然都還有賴相關單位盡速研擬適當解決方案，才不至於延宕及時改革導正的契機。

Analysis of the Security and Privacy Requirements of Cloud-Based Electronic Health Records Systems

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ABSTRACT

Background: The Cloud Computing paradigm offers eHealth systems the opportunity to enhance the features and functionality that they offer. However, moving patients' medical information to the Cloud implies several risks in terms of the security and privacy of sensitive health records. In this paper, the risks of hosting Electronic Health Records (EHRs) on the servers of third-party Cloud service providers are reviewed. To protect the confidentiality of patient information and facilitate the process, some suggestions for health care providers are made. Moreover, security issues that Cloud service providers should address in their platforms are considered.
Objective: To show that, before moving patient health records to the Cloud, security and privacy concerns must be considered by both health care providers and Cloud service providers. Security requirements of a generic Cloud service provider are analyzed.
Methods: To study the latest in Cloud-based computing solutions, bibliographic material was obtained mainly from Medline sources. Furthermore, direct contact was made with several Cloud service providers.

Results: Some of the security issues that should be considered by both Cloud service providers and their health care customers are role-based access, network security mechanisms, data encryption, digital signatures, and access monitoring. Furthermore, to guarantee the safety of the information and comply with privacy policies, the Cloud service provider must be compliant with various certifications and third-party requirements, such as SAS70 Type II, PCI DSS Level 1, ISO 27001, and the US Federal Information Security Management Act (FISMA).
Conclusions: Storing sensitive information such as EHRs in the Cloud means that precautions must be taken to ensure the safety and confidentiality of the data. A relationship built on trust with the Cloud service provider is essential to ensure a transparent process. Cloud service providers must make certain that all security mechanisms are in place to avoid unauthorized access and data breaches. Patients must be kept informed about how their data are being managed.

cloud-computing; eHealth; electronic health records (EHRs); privacy; security
We also recommendatient accessible electronic health records: exploring recommendations for successful implementation strategies.
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Introduction

Cloud computing environments provide a great opportunity to provide eHealth services in different scenarios in an effective and simple way. The scalability and mobility that a Cloud-based environment system can offer provides several advantages [1-9], but there are some barriers that must also be managed [10,11]. In the case of deploying a Cloud-based EHR management system, the main advantage is the ability to share patient records with other clinical centers, and the integration of all the EHRs of a group of clinical centers in order to help medical staff perform their jobs [12-14]. So, how can health care providers and clinical centers guarantee the security, privacy, and confidentiality of their patients' data? The privacy and security of data migrated to the Cloud represents the main barrier that the Cloud computing paradigm must overcome if a Cloud-based eHealth environment is to be deployed. This mission must be performed by both Cloud service providers and health care providers, since hosting EHRs in the Cloud requires a change of approach and they must take into account and address all these risks [15-17].

Security issues are critical when a health care provider plans to deploy a Cloud-based EHR management system. The health care provider must guarantee the security of patient data by ensuring that the Cloud platform has the needed security mechanisms in place. Transmission and network secure protocols also must be deployed in order to avoid external attacks to the data [18]. Moving patient data to the Cloud means that patient files are hosted in the servers of the Cloud service provider [19]. What does this mean? It is essential that these companies ensure the security of their databases so that the data cannot be accessed or modified by unauthorized users. It is important to be aware that privacy and confidentiality terms are essential when EHRs are migrated to the Cloud because of the sensitivity of patient data. In order to avoid unauthorized access, Cloud service providers must deploy authentication systems that ensure the privacy of patient information.

Governments must require that Cloud service providers fulfill the privacy requirements needed to ensure the privacy of patient data. The deployment of a legal framework will help to accomplish a secure environment [13,14]. Privacy policies have been legislated in several countries in order to regulate and safeguard the privacy of patient records. As an example, the US Health Insurance Portability and Accountability Act (HIPAA) regulates the privacy and security of US patient data [20]. These policies depend on each country. Furthermore, EHRs themselves are ruled by standards, which include security and privacy terms, such as Health Level 7 (HL7) [21,22], to guarantee data security and privacy. By combining these standards with Cloud policies and security mechanisms implemented by providers, a secure "Health Cloud" scenario will be achieved.

This paper addresses the health care providers' security and privacy issues that must be considered when deploying EHR management systems. Taking into account these issues on both sides, the migration process will be more secure and transparent. Some security mechanisms necessary to deploy a proper solution are suggested.
We will first elaborate on the issues and requirements for maintaining the security and privacy of EHRs. After that, we explain the requirements that a Cloud-based EHR management system must guarantee in terms of security. Also, some suggestions are given to health care providers in order to facilitate the process.

Methods

For the analysis and study of Cloud-based EHR systems, we reviewed published papers and research about security and privacy issues, which different Cloud computing providers use for development of their Cloud platforms. The related literature was obtained mainly from Medline sources. Direct contact with some Cloud service providers was made. Many publications that show the feasibility of Cloud computing implementations for eHealth services were reviewed in order to look for the latest information on this emerging technology. Most of them show the advantages that Cloud-based solutions can provide to eHealth systems.

Results

Electronic Health Record Security and Privacy Issues

The deployment of EHR management systems is one of the most important achievements in eHealth in recent years. The implementation of these systems has been growing rapidly. In fact, most developed countries have a high level of penetration of this kind of system.

According to Spanish law 41/2002, an EHR is defined as the documentation, which contains information about the clinical evolution of the patient during his or her health assistance process. In this law, the uses of EHRs are set out, requiring medical personnel to maintain the privacy of patients. The Spanish law treats this kind of information as “specially protected” files. This kind of nomenclature is set in the 15/1999 law with the purpose of guarding the privacy of sensitive patient information. The patient’s consent is required to manage and access this data, except in the case of an emergency where the patient’s life is at risk.

In the United States, HIPAA regulates and establishes the security and privacy requirements of patient data. This law includes two sections on avoiding the improper use of personal information: the Privacy Rule and the Security Rule. The HIPAA Privacy Rule establishes that the Protected Health Information (PHI) must be made available in order to provide the patient medical treatment, either with a Court order or with the authorization of the patient. This rule adds that the entities that use the health information must notify the patient about the use of their PHI. Furthermore, the Privacy Rule requires that entities accessing the PHI use the least amount of patient data necessary to meet their needs. The HIPAA Security Rule was set in 2003 and complements the Privacy Rule, adding several terms to address the digitalization of the patient health information. It has three kinds of security guarantees: administrative, technical, and physical [23-25].

Thus, as outlined above, health care providers must guarantee and preserve the security and privacy of EHRs, and then implement the required security mechanisms to keep patient information safe in the Cloud. Before explaining the mechanisms that a Cloud service provider must implement, we describe the security and privacy requirements of patient records.

Electronic Health Record Security and Privacy Requirements

Before moving EHRs to the Cloud, the EHR systems themselves must set several guarantees to preserve sensitive patient information. The combination of these security requirements with those of the Cloud systems will guarantee the privacy and security of EHRs hosted in the Cloud. The requirements to secure an EHR are described in Table 1 [22]. The security and privacy issues that a Cloud-based system must address in order to safeguard patient files are analyzed in the next section.

Security and Privacy Issues of Cloud-Based Health Solutions

Deploying Cloud-based health solutions is an important step in the development of eHealth. Cloud-based systems allow the ability to create scalable environments, which are adapted to user needs. This total adaptation is complemented by the savings offered by a pay-per-use system, like Cloud computing. Another great advantage comes from the fact that, when EHRs are hosted in the Cloud, medical personnel or patients have the ability to access the information at any time from wherever they have an Internet connection. Currently, with the global economic crisis, saving money could be one of the most important reasons that would drive a company to move its electronic health system into the Cloud. Therefore, Cloud service providers must take advantage of this fact when selling their prospective clients on the advantages of Cloud-based systems.

In order to guarantee the security of their systems, Cloud service providers must install several security mechanisms to keep the safety, privacy, and security of their clients' data. In the section below, we explain the different mechanisms that a Cloud service provider implements in its systems to maintain the security of files in the context of EHR security.

eHealth Cloud Security Issues

A Cloud-based EHR must maintain the same level of data security as data stored in the servers of the health care provider. Patients and medical personnel should know that their personal information is going to be stored with a third-party provider; the provider must guarantee the same security and privacy that the EHRs had in the local servers. The patient, obviously, is not involved in the process of moving their sensitive information to the Cloud, but information should be communicated to patients by the health care providers about the data migration. These communications are not simple notifications; instead, patients should be informed about all the advantages that a Cloud-based system offers for the management of their medical information. Patients should know that data management responsibility lies with both parties: the Cloud service provider and, in a more active way, the health care provider or clinical center. However, there are security issues that should be considered by both providers and customers of a Cloud-based EHR system.

Table 1. Requirements for maintaining the security and privacy of an electronic health There are many different kinds of personnel who will have access to the patient health record, from the patients themselves to the technicians responsible for the management of the provider's servers. Physicians, medical personnel, or employees of the Cloud service provider could have access to these data. To ensure the privacy of the patient data, a role-based access system is needed because a doctor may have different access requirements to the patient information than other technical personnel. In order to overcome this problem, an ID code or number must be assigned to each person allowed to access the stored information. Depending on the ID number, the user will belong to a group and each kind of group will have access to a certain part of the patient information [22-26]. For example, patients and doctors will get access to the entire health record whereas the personnel responsible for maintenance of the platform will be able to access only the information they need for proper system

operation. With this role-based system, the patients' privacy is relatively guaranteed. Figure 1 illustrates the different roles that could take part in a Health Cloud and the different versions they will have access to.

Network Security Mechanisms

The main risk to the information will likely be "outside" the Cloud platform. The provider personnel are not the main threat that has to be feared. It is important to know that when moving patient data to the Cloud, health care providers are exposing this information to several external threats because the data are now available via the Internet [23]. Therefore, the responsibility must lie with the Cloud provider itself to protect the security and privacy of the information by providing the security needed to avoid external attacks to steal or even delete the information.

Data Encryption

All sensitive patient information must be stored securely in a private medical record so that medical information can be shared by different doctors or medical personnel. In order to secure this transaction, the information must be properly encrypted and controlled.

Digital Signature

The digital signature is a very useful tool that provides authenticity, integrity, and nonrepudiation [14-15]. With this security mechanism, the authenticity of the digital record is guaranteed; it will be valuable to deploy this kind of system in the Health Cloud in order to avoid false data transactions. For messages sent through an unsecure channel, the digital signature gives the receiver the reassurance that a message or file was sent by the claimed sender. There are many cryptographic logarithms to deploy this kind of security tool [23].

Monitoring of System Access

Every access to the platform should be monitored in order to create a log of all the people that have had access to the system. In case of an incident, the log can be consulted to solve or find out the cause of the problem. It would be valuable to create a log to track every update and change to each medical record [23].

Figure 1. Role-based system with different electronic health record versions available depending on the kind of user of the Health Cloud.

Suggestions Before Moving Electronic Health Records to the Cloud

The main worries of health care providers planning to move patient information to the Cloud are data security and privacy. Migrating data to the Cloud means that a third party now has control over the Cloud-hosted data. In order to address the risks that could arise, Cloud clients should be well informed before moving data to the Cloud. In order to facilitate this process, the Cloud service provider's customers themselves should be informed about the services the Cloud provider offers them and the security mechanisms installed on the provider's servers. Cloud clients should demand total transparency from the Cloud service provider. Knowing this kind of information is critical to being able to choose the most suitable provider for the client's needs. Table 2 shows several security issues a client should consider when choosing the most appropriate provider [21].

Moving Electronic Health Records to the Cloud: Example of a Cloud Company's Security Requirements

Health care providers that decide to move their EHRs to the Cloud should be aware of these kinds of security mechanisms before migrating their records. There are several well-known Cloud service provider companies, for example, Amazon Web Services, Microsoft Cloud, GoGrid, or Salesforce, with similar security terms as explained below. Thus, this section is useful in the case of choosing a Cloud service provider. Based on the security deployed on several Cloud platforms, we suggest the following mechanisms to secure the Cloud system [22,26,27].

Third-Party Certification

In order to guarantee the safety of the data and meet the requirements of privacy policies, the Cloud provider must be compliant with various certifications and third-party requirements (see Table 3).

Monitoring

The provider should include automated monitoring tools to provide a high level of service performance and system availability. These tools should be available online for internal and external use.

Notification alarms can be configured when any modification of the data is made by the maintenance personnel or the users themselves. These tools will help track all the information changes made to the stored cloud data. Any kind of incident with the stored data will be monitored.

Information and Communication

In order to use the Cloud platform as a communication channel where personnel could be notified and kept up to date on everything that happens, the Cloud provider should employ various methods of internal communications in order to help employees to understand their roles and responsibilities, and to communicate significant events, if necessary. These communication methods could include orientation and training programs for newly hired personnel, video conferencing, and email, among others.

Employee Lifecycle

Several policies are established in the Cloud platform to manage user access. The Cloud service provider should require that staff with potential access to the patient data undergo an extensive background check (as permitted by law) commensurate with their position and level of data access. Some of these policies are shown in Table 4.

Physical Security

The data center building should be strictly controlled and secured with video surveillance, expert security staff, intrusion detection systems, and other electronic means. The authorized personnel should pass through authentication controls to access the data center floors.

Environmental Safeguards

Innovative architectural and engineering approaches should be used in database centers so as to avoid external agents that could damage them (see Table 5).

Configuration Management

The company should communicate all updates on both the infrastructure and the software itself, so as to minimize any impact on the customer and the service. The software updating process should be designed to avoid unintended service disruptions and maintain the integrity of service to the customer. Before updating software, these updates should be reviewed, experimented, and approved. The Cloud provider staff would manage the data center infrastructure and be responsible for the hosting management, system scalability, availability and auditing, and security management.

Business Continuity Management

The Cloud service provider must guarantee the availability of the service offered. In order to ensure system availability and continuity, the company should address the security issues considered in Table 6.

Backups

In order to guarantee the existence of the patient data stored in the Cloud, the provider should redundantly store these data. Multiple backups of these data should be stored in different data centers in various locations.

Storage Service Decommissioning

When a Cloud storage service comes to the end of its useful life, the provider should guarantee that data previously stored there is completely removed from its servers. Furthermore, the provider must ensure that unauthorized personnel have not copied these data.

Network Security

The platform itself is not the only element that should be secured by the provider. The Cloud provider must also secure the network. The network provider should guarantee significant protection against traditional network security issues, such as those summarized in Table 7.

醫療系統雲端化的挑戰

楊惟雯

資訊科技進步為人們生活環境帶來革命性的變化，永齡健康基金會資訊長劉立表示，未來每個人的日常活動都將很難離開「一雲四網五屏」的範疇，也就是由雲端運算架構，互聯網、電訊網、物聯網與有線電視網，以及人們身邊眾多的資訊終端裝置，如手機屏、電腦屏、電視屏、電子書屏、LED 屏等項目所共同建構生活環境。

而醫療市場自然也不能例外。醫療系統雲端化所帶來的好處，就是藉由網際網路，由服務供應商提供一個雲架構，以更即時、更具成本效益的方式，提供醫療機構最佳存取與體驗應用。

因應未來智慧醫療需求，各醫院都會需要雲端技術支援，例如:

1、一般病患從到醫院就診、做 X 光、超音波或其他種種檢查，往往會創造大量檢查、診斷的資料儲存量，且需因應平均壽命與相關法規需要，存放至少 70~80 年；

2、往後各醫院之間，因為聯網以及遠端照護中心的需要，各醫院對病人資料儲存量，將會持續增加；

3、未來各醫院之間的病歷資料將可聯網互通，讓病人在任何地方都能夠傳輸這些資料，讓醫生能夠異地進行診斷；

4、因應病患住院環境改善需求。如在台大心血管中心，住院病患不僅可以透過電視上網，家屬還可利用越洋視訊進行線上探病，或是藉助視訊方式和醫療團隊溝通討論。

一、從 Silo、Ultility 到 Cloud 的雲架構

當前的雲端服務，可分為 Silo Computing(混機建置)、Utility Computing(效率化建置)以及真正雲端運算(Cloud Computing)三種架構。Utility 與 Cloud 兩種模式是目前最常見到的應用趨勢，提供安全、可用、效能與彈性的網路應用。

以 Silo Computing 架構來說，其實是過去 IT 人員常見的系統建置方式，也就是既有舊系統與新系統混合並存建置、各自做擴充與維護。缺點在於無法準確評估新服務需求的硬體資源配置合理水位，而造成終端使用率低落；有些是新系統服務還沒用滿，卻因為某些舊系統的滿載，而必須連帶升級的浪費。

Utility Computing 架構則是將提供終端服務的伺服器機房聯外架構，建置成服務抽離層(Service abstraction layer)。由服務抽離層擷取來自終端的各種需求，並平均分派到提供對應服務的伺服器機台，從終端到伺服器的負載也會變得比較相對均衡，此種動態配置可減少停機時間(Downtime)，並提高處理效能。

雲端運算架構則是將提供終端服務的伺服器機房設施虛擬化(Vitualization)，透過網際網路把整個機房設施需求，外包給雲服務供應商，而相關軟硬體不需要自行添購建置，可壓低建置成本，並達成依需要量隨時增減雲服務量的投資效率。事實上，很多企業都很想導入雲端化，如公司入口網站(Portal)、E-mail 等都可以放到雲端，但對於企業內部許多敏感資料以及重要的應用，就不是很放心放到雲端。

所以，醫療系統雲端化時，可考慮建置一個以雲端運算加上 Utility Computing 的 Hybrid 混合雲系統，像用戶的 Portal、APIs 可以放到雲端；但是後面的數據庫、重要的醫療病歷資料還是要放在機房；有些無法雲端化的像是 Pay Roll 線上金流／付費系統，則還是使用類似 Silo 的架構，以穩定、高效能來個別應付。

二、邁向雲端的護理與醫院管理

傳統在醫院內執行護理與醫療工作時，經常需要填寫許多的文件與表單紀錄，這不僅造成工作人員莫大的行政負擔，整理、儲存、查詢、分析與傳遞這些紀錄亦非常不便。

因此，有醫療機構開始將資訊科技引進到醫療產業中，從醫療紀錄的電腦化開始，電子病歷(Electronic Medical Records；EMR)、可透過網際網路進行跨地域性(國家/全球化院際)病歷傳遞交換的電子化病患系統(Electronic Patient Records；EPR)，一直到最近的雲端電子化健康系統(Electronic Health Records；EHR)，讓系統除了個人的病歷資料外，更擴大範圍整合疾病及非傳統健康資訊，以便於提供人們更全面性的個人化照護。這樣做的好處是讓個人的健康資料能夠透過電子病歷交換中心的機制，在各個醫療單位間進行必要的流通，讓病患得享有不間斷的照護服務。

三、以聯新國際醫療集團為例

曾有台商在台灣壢新醫院照了一張胸部 X 光片，而他在返回大陸上海地區就診時，即可以藉由這樣的機制，將此影像轉送到當地的禾新醫院，讓治療醫師能更清楚地掌握病患狀況，以便進行更準確的處置。該位台商也曾經遇到要入境美國時，因身體不適而被阻攔，也是透過此機制即時傳送過去的醫療紀錄，以證明其沒有感染法定傳染病，而能順利進入美國從事商務工作。當然，這先決條件是該醫療體系內各單位所有的醫療紀錄都必須符合標準與安全的格式，才有辦法上傳到雲端的 EHR 系統。

以壢新醫院所屬的聯新集團私有雲運作為例子，除現有其集團內位於各地區的醫療單位都可透過 VPN 內部區域連線方式，將病患的健康資料集中在健康管理平台資料庫中，讓病患藉藉由對外連線主機掌握到個人的相關紀錄之外，藉由醫療照護系統與社區家庭的連線，也使得醫院能監控居民的健康狀況，並將之透過 3G、WiMAX 等行動通訊設備傳送給醫療照護小組成員以提供相關評估建議。一旦系統發出危急警示時，亦可立即進行 GPS 定位，並派出救護車前往該地救援。壢新醫院是台灣第一個透過此一方式，整合社區公衛群及醫療群資源的醫療單位，而截至目前為止，已經有 2 萬多個家庭病患受到照護。

三、台灣健康雲建構醫療／照顧／保健三合一

對於政府來說，醫療業導入雲端化的目的在於建立「個人電子病歷交換雲端服務」與「智慧醫療系統雲端服務」，以做為醫療單位未來打造分散式智慧醫療網的基礎，以減少不必要的重複投資浪費，最終達到提高醫療服務品質與水準的目的。

值得強調的是，未來的在家照護系統、遠端監控系統，均需要透過雲端平台來完成「軟硬體結合服務」的營運模式。期望能藉由資通訊技術(ICT)的介入，達成在疾病發生前就先做好防禦性的監測，以及生病之後可透過系統進行有效控制與支援，實現人們「零就醫」的美好世界。

未來，以國民電子健康紀錄(EMR)為核心，集合醫療雲(Medical Cloud)、照顧雲(Care Cloud)及保健雲(Wellness Cloud)為一體的台灣健康雲(Health Cloud)，備受各界期待。

以照顧雲來說，將是每個人年老時都需要。衛生署就有個運用雲端 IT 科技的遠距照顧計畫，但目前僅在長期照顧機構上看到曙光。如英國 West Lothian 小鎮以床邊感測器結合雲端機制，創下當老人不慎跌落時僅 22 分鐘就趕赴至現場處理的能力。英國市場在居家照顧上的先進，也得力其保險業勇敢的納入與試驗。反觀台灣目前遠距照顧(Telecare Service)部分，除了機構式照顧之外，居家與社區照顧尚未找出可持續運作的服務模式。其次，保健雲 (Wellness Cloud)將是創意最多的領域。例如，Nike 早期曾推出 Nike+感測器，任何標示 Nike+的球鞋在安置 Nike+感測器後，可由用戶的 iPhone、iPod 自動感應並安裝相關軟體，時時幫用戶自動進行跑步記錄，還可以上傳到 Nike 網站並貼到臉書上。

此外，保健雲除了健身、保健之外，還可以結合旅遊、運動、養生食物，以及台灣擅長的消費性電子產品。例如先前的 101 登高大賽，就有 200 位登高參賽者，每位胸前貼上一個陽明大學研發的無線微心電圖計，可以隨時回傳看到每位參賽者在每個樓層的心跳狀態。

至於醫療雲，還可以協助建立 Personalization(個人化)、Participation(參與)、Prediction(預測)與 Prevention(預防)的 4P 醫學。許多醫院已慢慢將其電子病歷資料(Electronic Health Record；EHR)轉換成有高附加價值的臨床資料庫(Clinical Data Repository；CDR)；健保局也有一份集結過去 12 年來全台灣 2,300 萬人的國民健康保險研究資料庫(NHIRDB)，供學術／研究人員申請、取得；衛生署也已開發生物統計加值雲(Biostatistics Value-add Cloud)，將健保局資料還有癌症、死亡檔案等資料庫在匿名狀態下相互串連；國家癌症中心的癌症研究雲，也希望能將每年花掉 300 億新台幣的生物醫學學術研究成果累積起來，如何累積這些基因資料庫，做為未來個人化醫療的依據，將是值得努力的方向。

北醫也聯合幾家醫院合作一套醫療終端運算系統(Medical End-User Computing system；MEUC)，在面對各種層層阻礙之後，將各醫院病歷資料去除掉個資之後，透過 MEUC 平台來做交換，做為跨醫院臨床病歷的雲端研究資料庫，彌補了健保資料庫內欠缺每個健保病患的確診資料缺憾，讓更多研究可以在裡面實現。

總之，雲端運算會改變生醫研究資料庫服務的面貌，但雲端運算同步要把隱私做好，對健康資訊科技(HIT)未來發展非常重要，尤其在一些醫療資源缺乏的開發中國家地區，其彈性與成本效益可以符合各種健康照顧的需要，並解放既有 IT 架構中規模延展性與存取性的門檻限制。

四、醫療系統雲端化面對的挑戰

雲端化可以節省成本，隨時隨地因應客戶終端的需求存取醫療資訊，但其技術層面仍要面對許多挑戰，例如病歷儲存年數、加密以及存取權限，限制哪些人

才能接觸這樣的訊息。此外，因為外包會造成醫療機構對自家資料庫管控力變薄弱；以及雲端供應商能否因應醫療機構的需要，以解決雲服務供應商跟醫療機構的資料庫軟體相容性搭配，也是必須面對的挑戰。另外，也有人擔心，病患隱私資料放在公有雲上的安全問題。臺北醫學大學醫學科技學院院長李友專對此表示，在醫院對病患隱私資料還無法放心放置在公有雲之際，醫院可先行建置成私有雲，馬上就享有節省電費與 IT 管理成本的好處，未來若能將此高效率系統複製到雲端，或許還會出現想像不到的商業模式。

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