Health literacy as a predictor of emergency department visit and self-rated health among Chinese immigrants: findings from an Australian survey

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Abstract

Background

Health literacy is an important determinant of health and healthcare utilization. People with inadequate health literacy often experience difficulties in navigating healthcare systems and tend to have poor health. Immigrants are one of the vulnerable groups at risk due to linguistic and cultural barriers, which may consequently affect healthcare utilization and health. Despite being the largest immigrant population in the world, little is known about health literacy and its association with health or healthcare utilization in Chinese immigrants.

Aims

This study aims to 1) examine health literacy among first generation Chinese immigrants living in Australia; 2) identify the specific health literacy areas associated with emergency department (ED) visits and self-rated health.

Methods

Chinese immigrants (≥18 years) born in mainland China, Hong Kong, Macau, or Taiwan living in Australia were recruited from Chinese community organizations across New South Wales, Australia and surveyed for health literacy, ED visits in the past 12 months, and self-rated health. Health literacy was assessed using Health Literacy Questionnaire (HLQ), a multidimensional instrument comprising nine health literacy domains.

Results

On average, participants (n=362) were 59 years old (SD: 16), had resided in Australia 13 years (SD: 9). The majority were female (n=246, 68%) and born in mainland China (n=332, 92%). More than half had university or higher education level (n=190, 53%). In the past 12 months, 20% of the participants (n=74) had visited the ED; more than half rated their health as fair/poor (n=205, 57%).

Multiple areas of health literacy were inadequate, the most common of which were *Actively engaging with healthcare provider, Navigating the healthcare system, Finding good health information*, and *Reading and understanding health information*. Approximately 70% or more participants were experiencing some degree of difficulty. Health literacy was significantly lower among participants who were older (≥ 65 years), migrated to Australia at older age (≥ 55 years), had lived in Australia less than 5 years, did not have university level education or proficient English.

After adjusting for age, gender, and education ED visits were more common in participants who lacked social support for health (OR: 1.80; p=.031) and ability to appraise health information (OR: 2.22; p=.005) and fair/poor self-rated health was more common in those who had insufficient health information (OR: 1.81; p=.025), not actively managing their health (OR: 1.72; p=.048), and lacking ability in appraising health information (OR: 1.70; p=.048).

Conclusions

Inadequate health literacy is present in many Chinese immigrants and is associated with higher prevalence of ED use and poorer health status. Older people who migrated at an older age or more recently and have fewer language or education resources are at greater risk of inadequate health literacy and issues with understanding how to access health information and engage with the healthcare system increase healthcare utilization. Therefore, early screening and support for health literacy is critical in first-generation Chinese immigrants.

Keywords: health literacy, immigrant populations, ethnic minority, ED visits, self-rated health

Introduction

Healthcare utilization including emergency department (ED) visits is growing rapidly and indicates adverse population health. Increasing ED utilization adds a burden on the healthcare system globally especially when a large portion of ED visits are preventable. In the United States approximately 37% of the total ED visits are for non-urgent conditions[1]; and in Australia, around 50% of ED visits are for semi-urgent or non-urgent conditions[2]. The prevalence of ED visits, especially ED visits for non-urgent conditions was significantly higher in certain populations such as ethnic minorities and immigrants [3-5], which could lead to excessive healthcare spending, unnecessary testing and treatment, and weaker patient-primary care provider relationship [6, 7].

In addition to higher prevalence of ED visits, ethnic minorities and immigrant populations are the most disadvantaged groups in health outcomes including self-rated health (SRH) [8]. SRH integrates biological, mental, social and functional aspects of a person[9], and often correlates with chronic illness, emotional distress, disability and functional limitations [10]. More importantly, SRH as an independent predictor of later mortality has been demonstrated in numerous studies across diverse populations [11, 12]. Therefore, SRH is considered as a valid measure of general health and an important predictor of health issues. It is notable that ethnic minority groups are often reported to have poorer SRH compared to the general populations in countries such as the United Kingdom (UK) and the United States (US). This was particularly evident in people from Asian, African, and Caribbean backgrounds[13, 14]. Understanding the factors associated with high prevalence of ED visits and poor SRH among ethnic minorities and immigrants is particularly important in tackling health problems and improving equity.

Despite the multifactorial and complex nature of ED use and SRH, current studies indicate that they both share similar determinants including age, race, language proficiency, education, and social economic status [4, 15, 16]. Emerging evidence also indicates health literacy, a set of comprehensive skills required for an individual to function effectively in the healthcare environment, may also play an important role [17, 18]. As showed in one systematic review, approximately 40% of the patients

who presented in ED had low health literacy [19], which was independently associated with increased ED visits and higher ED-related costs [19, 20]. Furthermore, people with low health literacy were more likely to report poorer SRH, which is applicable across different populations including those from culturally and linguistic diverse (CALD) background[19, 21, 22].

Healthcare utilization and health issues among immigrant populations are especially concerning for western countries, such as the US, Canada and Australia, which are receiving rapidly increasing numbers of immigrants. While ethnic minorities and immigrants are disproportionally affected by lower levels of health literacy [23-26], the understanding of association between health literacy, healthcare utilization, and health is lacking. This is an important consideration when supporting the development of preventative strategies. Despite this, immigrant populations were more likely to be excluded from health research due to linguistic and cultural barriers [8]. For example, there is a paucity of information about health literacy and its relationship with healthcare utilization and health among Chinese immigrants; one of the largest immigrant groups in Western countries [27]. Given the complex nature of health literacy, identification of health literacy areas specifically associated with ED visits and SRH are often difficult due to characteristics of the health literacy instrument used, and, therefore, have been largely overlooked in research to-date.

This study aimed to 1) examine health literacy among first-generation Chinese immigrants living in Australia; 2) identify the specific health literacy areas associated with ED visits and SRH.

Methods:

Participants

Participants of this descriptive study were recruited from the Chinese community organizations across New South Wales of Australia, as well as through a non-discriminative snowball sampling method. These met the following criteria were approached for possible participation: 1) aged ≥ 18 years; 2) born in mainland China, Hong Kong, Macau, or Taiwan; 3) current residents of Australia; 4) able to speak and read Mandarin enough to understand the study information and respond to the

questionnaire. Those with neurocognitive impairment were excluded from this study.

The sample size was calculated using Raosoft [28]. To obtain a representative sample, with 5% margin of error, 95% confidence level in a population of >20,000, a total of 377 participants was required. Recruitment of an additional 10% was undertaken to allow for missing data.

Recruitment

Participants were recruited using both convenience and snowball methods. Initial participants were recruited from four non-profit independent Chinese community organizations based in suburbs with a high density of Chinese immigrants in metropolitan Sydney, Australia. These included the Australian Asian Cultural Association, Chinese Christian Community Service Centre, Sino-Australian Senior Association, and Auburn Diversity Service Inc. An information session was provided during a group activity session in each organization and interested members who met recruitment criteria were provided with the study information in Mandarin by a bilingual researcher (LZ) and time to consider participation. Following written consent, participants completed the survey with the researcher available to assist if necessary. A non-discriminative snowball sampling method was utilized through these initial participants, by encouraging them to pass the study information to any family members and friends who met the recruitment criteria. Those gave consent could choose to come to the community activity sites to complete the survey or require a survey form to complete at their convenience then return to the researcher. The process continued until the calculated number of participants was reached. Data collection took place between July and October 2017 after ethics approval was obtained from the Ethics Committee of the University of Sydney (2017/ 355).

Health literacy measure

Health literacy was measured using the Health Literacy Questionnaire (HLQ) (simplified Chinese version). The HLQ was developed and validated for measuring health literacy in the public population by Ophelia in 2012 [29]. The uniqueness of

the HLQ is the instrument assesses the individual's health literacy, as well as that related to the external environment in relation to health. The HLQ addresses nine health literacy domains comprising 44 items (Box 1). The score for each domain is the mean of the item scores and high scores indicate better health literacy. The simplified Chinese version of HLQ was translated by the questionnaire developer [29] and used in several studies previously [23, 30], but the validity of this version has not been tested.

Box 1 Health Literacy Questionnaire domains, items and response format

Health literacy domains	No of items	Response format
1. Feel supported by HCP [a]	4	Domains measured on a 4-point scale: 1-strongly disagree, 2-disagree, 3-agree, and 4-strongly agree
2. Have sufficient information	4	
3. Actively managing health	5	
4. Social support for health	5	
5. Appraise health information	5	
6. Actively engage with HCP	5	Domains measured on a 5-point scale: 1-always difficult, 2-usually difficult, 3-sometimes difficult, 4-usually easy, and 5-always easy
7. Navigate the healthcare system	6	
8. Find good health information	5	
9. Read and understand health information	5	

[a] HCP healthcare provider

Data collection

The health literacy and sociodemographic and clinical data were collected by using self-administered HLQ. The sociodemographic and clinical data included age, gender, birth place, education, employment, English spoken at home or not, chronic health conditions and private insurance, as well as ED visits in the past 12 months using HLQ. In addition, self-reported English proficiency and health status were also collected based on a 5-point Likert scale (excellent, very good, good, fair, and poor) which were utilized by Australian Bureau of Statistics [31].

Statistical analysis

Data was analyzed using the SPSS version 24 statistic program [32]. Sample characteristics are reported as mean, standard deviation (SD), frequency and percentage depending on the type of variable. An independent sample t-test was

used to compare scores on health literacy domains between social-demographic groups. Binary logistic regression was used to examine the associations between health literacy domains, ED visits and SRH. A crude model was run to investigate the association between each of the health literacy domains, ED visits and SRH respectively, followed by an adjusted model accounting for age, gender and education, which are the important predictors of health literacy. Both unadjusted and adjusted results were reported as odds ratio (OR) and 95 % confidence interval (CI), and with the level of significance being determined at a P-value <0.05.

Results

A total of 362 participants were included in the data analysis (53 participants were excluded from analysis due to missing data) (Table 1). Most participants were female (n=246, 68.0%) and born in mainland China (n=332, 91.7%). Participants had a mean age of 59.4 ± 16.0 years and had resided in Australia 12.8 ± 9.2 years, with 29.6% (n=107) considered to be new immigrants having lived in Australia less than 5 years. More than half the participants had a university or higher education (n=190, 52.5%) and 75% of the participants reported with fair/poor English proficiency (n=272). Slightly more than half reported fair/poor SRH (n=205, 56.7%) and 20.4% (n=74) had visited ED during the past 12 months.

Table 1. Overall sample characteristics (n=362)

Characteristics	mean	SD
Age (years)	59.4	16.0
Age of migration (years)	46.4	18.0
Years living in Australia (years)	12.8	9.2
	n	**%**
Gender (male)	115	31.8
Education		
Primary school or lower	29	8.0
Completed high school	141	39.0
University or higher	190	52.5
English spoken at home	42	11.6
English proficiency		
Good	90	24.9
Fair/poor	272	75.1
Not in workforce	241	66.6
Chronic conditions		
Arthritis	106	29.3

Cardiovascular diseases	91	25.1
Back pain	65	18.0
Diabetes	44	12.2
Other	41	11.3
No of chronic conditions		
None	156	43.1
1	105	29.0
2	55	15.2
3+	45	12.5
Privately insured	162	44.8
ED visit in the past 12 months	74	20.4
Self-reported health status		
Good	156	43.1
Fair/poor	206	56.9

Health literacy

Table 2 provides an overview of the mean HLQ domain scores for participants. For the first five domains, answered using response options from strongly disagree to strongly agree (range 1 to 4), the highest score was seen for the domain *Social support for health* (mean: 2.90; SD: .46). The lowest scores were for *Having sufficient information* (mean: 2.76; SD: .54). For the last four domains, answered using response options from cannot do to always easy (range 1 to 5), the highest score was observed in the domain *Reading and understanding health information to know what to do* (mean: 3.39; SD: .73). The lowest score was observed in the domain *Finding good health information* (mean: 3.23; SD: .77).

Table 2. Comparison of the health literacy domain scores between social-demographic groups (mean; SD) [a].

	Health literacy domains	Overall scores	Age ≥65		Age to Au ≥ 55		Years in Au < 5		Female		Education < Uni		Proficient English	
			Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Domains measured on a 4-point scale	**Feel supported by HCP** [b]	2.84 (.57)	2.89 (.54)	2.80 (.58)	2.80 (.59)	2.86 (.55)	**2.66 (.64)** ***	**2.91 (.51)**	2.82 (.59)	2.87 (.52)	2.85 (.60)	2.82 (.54)	2.89 (.48)	2.82 (.59)
	Have sufficient information	2.76 (.54)	2.71 (.56)	2.80 (.52)	**2.66 (.62)** **	**2.83 (.47)**	2.70 (.59)	2.78 (.52)	2.74 (.55)	2.80 (.52)	2.73 (.57)	2.79 (.51)	**2.88 (.44)** *	**2.73 (.56)**
	Actively managing health	2.87 (.51)	**2.95 (.48)** *	**2.82 (.52)**	2.93 (.52)	2.83 (.50)	2.90 (.54)	2.86 (.50)	2.86 (.48)	2.88 (.55)	2.87 (.49)	2.87 (.52)	2.80 (.47)	2.89 (.51)
	Social support for health	2.90 (.46)	2.87 (.48)	2.91 (.45)	2.86 (.53)	2.92 (.40)	2.91 (.49)	2.89 (.45)	2.87 (.48)	2.96 (.42)	2.89 (.46)	2.90 (.46)	2.92 (.38)	2.89 (.48)
	Appraise health information	2.82 (.50)	2.79 (.55)	2.84 (.47)	2.76 (.57)	2.86 (.45)	2.77 (.57)	2.84 (.48)	2.79 (.51)	2.88 (.49)	**2.76 (.55)** *	**2.87 (.46)**	2.87 (.42)	2.80 (.53)
Domains measured on a 5-point scale	**Actively engage with HCP**	3.37 (.76)	**3.17 (.79)** ***	**3.50 (.71)**	**3.10 (.82)** ***	**3.56 (.66)**	**3.19 (.81)** **	**3.44 (.72)**	3.31 (.80)	3.48 (.67)	**3.16 (.76)** ***	**3.56 (.72)**	**3.78 (.50)** ***	**3.23 (.79)**
	Navigate the healthcare system	3.25 (.78)	**3.05 (.82)** ***	**3.39 (.72)**	**2.97 (.84)** ***	**3.46 (.66)**	**3.07 (.82)** **	**3.33 (.75)**	**3.19 (.81)** *	**3.40 (.68)**	**3.05 (.76)** ***	**3.44 (.75)**	**3.68 (.58)** ***	**3.11 (.78)**
	Find good health information	3.23 (.77)	**3.02 (.81)** ***	**3.38 (.71)**	**2.93 (.82)** ***	**3.45 (.66)**	**3.06 (.81)** **	**3.31 (.75)**	3.18 (.79)	3.35 (.73)	**2.99 (.78)** ***	**3.46 (.69)**	**3.71 (.56)** ***	**3.08 (.77)**
	Read and understand health information	3.39 (.73)	**3.14 (.72)**	**3.56 (.69)**	**3.10 (.74)**	**3.60 (.65)**	**3.26 (.76)**	**3.44 (.71)**	**3.34 (.76)**	**3.51 (.64)**	**3.12 (.69)**	**3.64 (.68)**	**3.87 (.47)**	**3.23 (.73)**

			***	***	*	*	***	***

a group comparison using independent sample t test;

b HCP: healthcare provider

P values: * P<0.05; ** P<0.01; *** P<0.001.

Although the differences across the mean scores of each domains were small, a large proportion of the participants was found to have inadequate health literacy across all the domains when the mean scores were dichotomized into the categories of adequate and inadequate health literacy (for the first five domains <3 represents 'disagree' and ≥3 represents 'agree'; for the last four domains <4 represents 'difficult' and ≥4 represents 'easy') (Figure 1). The most commonly reported domains with difficulty were *Actively engaging with healthcare provider, Navigating the healthcare system, Finding good health information, and Reading and understanding health information to know what to do*, with approximately 70% or more were experiencing certain degree of difficulty.
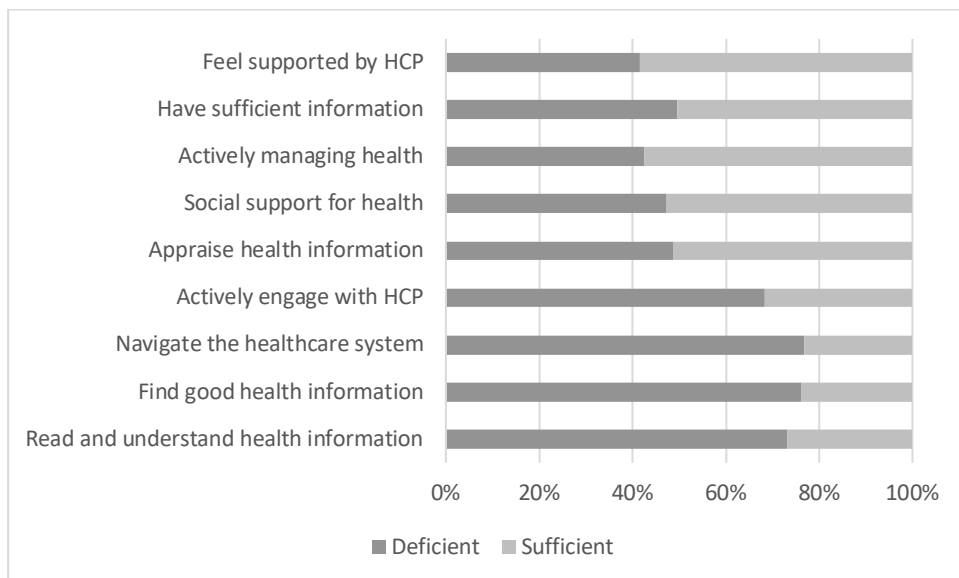

Figure 1. Proportion of the participants reported inadequate health literacy across nine health literacy domains

Health literacy comparisons

Differences in health literacy were evident for age, years in Australia, gender, education and English proficiency (Table 2). Overall, the participants who were older (≥ 65 years), migrated to Australia at older age (≥ 55 years), had lived in Australia less than 5 years, did not have university education, or were not proficient in English language had significantly lower scores for the domains *Actively engaging with healthcare provider, Navigating the healthcare system, Finding good health information, and Reading and understanding health information to know what to do*

for. Similar effects were seen in the same domains for females except for the domains *Actively engaging with healthcare provider* and *Finding good health information*. Furthermore, participants who were older (≥ 65 years), migrated to Australia at older age (≥ 55 years), had lived in Australia less than 5 years, or were not proficient in English language had significantly lower scores in one other domain each with no consistent effects noted.

Health literacy as correlates of health-related outcomes

Participants having inadequate health literacy had increased likelihood of ED visits in the domains *Social support for health* by 70%, *Appraising health information* by 85%, and *Actively engaging with healthcare provider* by 95% (Table 3). After adjusting for age, gender, and education significant predictors of ED visits remained for inadequate health literacy in both *Social support for health* (OR: 1.80; CI: 1.05-3.08) and *Appraising health information* (OR: 2.22; CI: 1.28-3.85).

Participants having inadequate health literacy also had increased odds of reporting fair/poor SRH in the domains *Having sufficient health information* by 75%, *Actively engaging with healthcare provider* by 93%, *Navigating healthcare system* by 74%, *Finding good health information* by 153%, and *Reading and understanding health information to know what to do* by 138%. However, after adjusting for age, gender, and education only inadequate health literacy in the domain *Having sufficient health information* remained as significant predictor of fair/poor SRH (OR: 1.81; CI: 1.08-3.03). In addition, inadequate health literacy in the domains *Actively managing health* (OR: 1.72; CI:1. 00-2.94) and *Appraising health information* (OR: 1.70; CI: 1.01-2.87) predicts fair/poor SRH.

Table 3. Association between deficiency in health literacy domains and health-related outcomes (unadjusted and adjusted) [a].

Deficiency in health literacy domains	ED visit				Poor to fair self-rated health			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Feel supported by HCP [b]	1.16	.69, 1.94	1.42	.83, 2.43	.95	.62, 1.44	1.25	.73, 2.12
Have sufficient information	1.45	.87, 2.43	1.37	.81, 2.32	**1.75****	**1.15, 2.67**	**1.81***	**1.08, 3.03**
Actively managing health	1.34	.80, 2.25	1.52	.89, 2.60	1.16	.76, 1.76	**1.72***	**1.00, 2.94**
Social support for health	**1.70***	**1.01, 2.85**	**1.80***	**1.05, 3.08**	1.25	.82, 1.90	1.29	.77, 2.16
Appraise health information	**1.85***	**1.09, 3.11**	**2.22****	**1.28, 3.85**	1.44	.95, 2.190	**1.70***	**1.01, 2.87**
Actively engage with HCP	**1.95***	**1.07, 3.58**	1.83	.97, 3.44	**1.93****	**1.23, 3.02**	1.06	.60,1.86
Navigate the healthcare system	1.27	.68, 2.38	1.19	.62, 2.29	**1.74***	**1.06, 2.84**	1.01	.55, 1,86
Find good health information	1.46	.77, 2.78	1.36	.69, 2.65	**2.53*****	**1.54, 4.15**	1.43	.78, 2.64
Read and understand health information	1.47	.80, 2.70	1.28	.67, 2.44	**2.38*****	**1.48, 3.82**	1.14	.64, 2.06

[a] Using binary logistic regression adjusted for age, gender, and education;

[b] HCP: healthcare provider;

P value: * P<0.05; ** P<0.01; *** P<0.001.

Discussion

This is the first study clearly identified specific health literacy limitations among Chinese immigrants in Australia. The majority of the Chinese immigrants in this study had limitations in the areas of accessing health information and healthcare system. Our study also highlights the differences in health literacy within demographic sub-groups of Chinese immigrants. Particular groups significantly affected by inadequate health literacy are those who are older, or migrated to Australia at older age, those in the host country less than five years, as well as those with less than university education or poor English proficiency. Differences regarding health literacy are also observed between gender, with female Chinese immigrants more likely to experience limited health literacy. Inadequate health literacy is independently associated with higher prevalence of ED visits and poor SRH in Chinese immigrants. However, the association with ED visits is limited to interactive and critical health literacy, while the association with SRH is across all three levels health literacy including functional, interactive and critical.

Health literacy in Chinses immigrants

Immigrant populations are well known to be vulnerable in terms of health inequalities [33]. Our study confirms that Chinese immigrants are disadvantaged in health literacy, which is consistent with the previous studies demonstrating that people who born overseas or speak a language other than English have significantly lower health literacy in Australia and other countries [23, 34]. However, due to the characteristics of survey instrument or study design employed, the majority of these studies could not identify the specific health literacy areas immigrant populations might struggle with. In contrast, the HLQ used in this study allow us to examine multiple health literacy domains and further the knowledge. As noted, the majority of Chinese immigrants reported having difficulties finding / understanding health information, navigating the healthcare system, and establishing relationships with healthcare providers. This may explain in part why people from CALD backgrounds are less likely to have sufficient health knowledge or access necessary services, and consequently at risk of poor self-management of health [35-37]. Furthermore, this may particularly be the case for those older or migrate at older age, female, have

shorter duration of stay in host countries, or had less education. These people are also well-known having limited language skills and difficulties in adapting to their new society [23, 38, 39], which adds additional limitations to their health literacy. Our findings provide new knowledge into mechanisms that may contribute to health disparities in immigrant populations. The health literacy limitations identified indicate interventions such as translated health information or interpreter services may useful, but are not enough to support immigrants given the complexity of health literacy disadvantages they are experiencing, and a broad approach operating at different levels including individual, organizational and policy may be required.

Health literacy and ED visits

Previous studies have linked inadequate health literacy to healthcare utilization, but this showed different tendencies depending upon the populations, type of healthcare services, and health literacy measured [40]. Among immigrant populations, low health literacy is often associated with poor healthcare utilization including underutilization of preventive or primary healthcare services and overutilization of ED services [40-42], which is partly confirmed in this study. However, the majority of the previous studies explored the association between ED visits and overall health literacy, in most cases, which was referred as writing /reading competencies or functional health literacy, a much narrower health literacy definition [43]. The questionnaire used in this study allows us to examine the specific health literacy areas that were associated with ED visits; specifically, inadequate health literacy in both *Ability to appraise health information* and *Social support for health*. According to Nutbeam's health literacy schema and HLQ developer, both areas reflect one's interactive and critical health literacy enabling a person to complete more difficult health-related tasks compared with functional health literacy [29, 43]. In contrast to the previous findings, association between ED visits and functional health literacy has not been found in the current study.

These unique findings may possibly be explained by the level of health literacy required in healthcare service decision-making process. Such processes often need the individual's competencies beyond the basic skills such as reading and writing, but the knowledge of disease and healthcare system, as well as the critical analytic skills

in the given situation. Without interactive and critical health literacy, people often lack knowledge or have misinformation, thus are unable to make an appropriate decision. Therefore, it is not surprising that ED overutilization is frequently observed among immigrants who perceive ED services as better, or lack knowledge of alternative healthcare services [1, 3]. In addition, higher prevalence of ED visits may also relate to underutilization of primary healthcare resulting from low health literacy. It was noted that preventive programs and regular health check are significantly underutilized among immigrants who have limited health literacy [3, 35, 39], which could consequently prevent early disease detection and result in emergency medical situations.

However, besides the health literacy, other factors relevant to immigrant populations such as culture and acculturation are also influential in terms of healthcare choices. As showed in previous studies, immigrants from different cultural backgrounds have distinctive beliefs about diseases, symptom experiences, emotional responses, as well as self-management behaviors and treatment decisions and degree of acculturation could add variations to it [39, 44]. Therefore, further research is warranted to parse out the differential effects of culture, acculturation, and health literacy on healthcare utilizations.

Health literacy and health status

The association between health literacy and health outcomes is consistent across immigrant populations with the majority of research demonstrating a positive relationship between health literacy and health outcomes [22, 45, 46]. This study confirmed that health literacy is a significant predictor of SRH, a key health status variable. The lower Chinese immigrants' health literacy, the more likely they rated their health as poor. Unlike the association found between health literacy and ED visits, SRH is associated with all three levels health literacy including functional, interactive, and critical health literacy which is reflected in the corresponding health literacy areas: *Actively managing health*, *Having sufficient health information*, and *appraising health information* [29]. The findings indicate Chinese immigrants may have poor self-management ability which is affected by their health literacy levels.

Effective self-management requires knowledge, confidence and skills, that are important in managing chronic conditions and improving health outcomes. Functional, interactive, and critical health literacy progressively allow for greater autonomy and personal empowerment in disease self-management [43]. For example, functional health literacy enables a person to read a prescription or medication label appropriately; interactive health literacy makes extraction and application information, active participation in health-related activities possible; critical health literacy allows to critically analyze and use information to exert greater control over their life [43]. It has been demonstrated in a growing literature, that inadequate health literacy leads to poor self-management abilities and behaviors including disease knowledge, self-efficacy, and beliefs [47-50]. In the current study, more than half of the participants with at least one chronic condition require long-term self-management. However, the majority had inadequate health literacy, which could ultimately compromise self-management. Therefore, it is not surprising that a large proportion of the participants rated their health status as poor. Moreover, inadequate health literacy areas found in the study may also partially explain the rapid decline in health among immigrant populations after the presence of a 'health immigrants' effect'. Given the high prevalent chronic conditions and inadequate health literacy, our findings raise a considerable health concern in people from CALD background.

Limitations

This study has several limitations and findings need to be carefully interpreted. Firstly, due to the sample methods, participants might have come from socially cohesive group and not be generalizable. Second, variables in self-administered questionnaire such as health literacy, SRH are subjective measures and can lead to measurement bias. Moreover, people with low literacy might have been excluded due to self-administered questionnaire format.

Implication

The study findings provide insight into Chinese immigrants who experience inadequate health literacy and suggest that one fits all solution may not be adequate

for immigrant populations who require extra support in certain health literacy areas. The findings also suggest that early identification of those immigrants less likely to adapt to the new society and at greater risk of poor health literacy is critical in prevention of further disparities in health and healthcare utilization. Moreover, health and health literacy issues in immigrants should not be viewed separately. Instead, viewing the issues in the environment immigrants live in cooperation of individual's situation may help healthcare professionals with a better understanding of the disparities this population facing and the strength they have. While putting efforts to eliminate health literacy limitations, the health literacy strength identified in this population should be acknowledged and utilized to optimize healthcare utilization and health.

Conclusion

Inadequate health literacy present in many Chinese immigrants is related to accessing health information and engaging with healthcare system, which is associated with higher prevalence of ED use and poor health. Older people, those who migrated at an older age, or those with a shorter length of stay in the new society and have fewer language or education resources are at greater risk of inadequate health literacy. Consequently, they have issues with understanding how to access health information and engage with the healthcare system and thus increase healthcare utilization. Therefore, early screening and support for health literacy is critical in first-generation Chinese immigrants in optimizing health and healthcare resources**.**

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