

Business and Marketing Analysis Research in Healthcare Technology for Remote Patient Monitoring Services

Cowriters:

Qianwen Wang

Yifei Zhao

School of Business, University of Wisconsin-Madison

MHR 765: Contemporary Topics

Dr. Adam J Bock

April 30, 2024



Agendas

Voice of customer/ stakeholder: interviews
Voice of customer/ stakeholder: online survey
Market/ market size/ market trends analysis

Executive Summary

Following is the report of the key findings with an outline of the current market for Chirp from our recent research on the implementation of remote patient monitoring (RPM) technologies, especially in healthcare areas, for aging home or nursing home usage and willingness of new products. It is from the report, patient safety, labor, cost, and regulatory compliances collected from the market interviews outstanding, in order to help generate recommendations for the services of Chirp.

In the first part, the report starts with the overview of the caregiving industry with the essential features identified and explained. pivoting into the second part, the report exploited the secondary data to uncover market patterns as well as potential growth opportunities in fields where digital caregiving is mostly needed. At the last part, the report inquiries on finding actual market size based on the governmental dataset, in multiple levels of distinct aspects.

Progress Report

In current healthcare area and especially in aging care and nursing home, Chirp launched the domain of Remote Patient Monitoring (RPM) services.

Voice of customer/ stakeholder: interviews (6)

As consultant groups, in order to help with Chirp to build up the future landscape, we focused on potential stakeholders' interviews to find out the point of view from industry experts whose visions resonate with Chirp's innovative direction, and we reached out to key industry figures, such as

- We conducted online and offline interviews with over 40 different hospitals, nursing agencies and nursing and aging homes through email, phone calls, and walk-in appointments to look for any viable opportunities.
- Interim UW CIPE Director
- Co-Coordinator of the UW IPE Healthy Aging Initiative
- Outreach Specialist for the School of Nursing's Center for Aging Research and Education (CARE),
- Clinical Nurse
- Orthopedic surgery specialist
- General surgical oncologist

to enrich our market knowledge. And until now, there are still many emails waiting for replies, and we have also encountered situations where the interviewers did not show up after the appointment time. The longest time we waited in the UWhealth lounge area was 3 hours.

Voice of customer/ stakeholder: online survey (83 valid data out of 170)

We also conducted a detailed survey of healthcare professionals to understand the overall perspective of the industry and understand the industry trends of the adoption of new technologies in the healthcare market.

Firstly, the survey covered questions that took more than 15 minutes to read. After we distributed it, we encountered great obstacles and received a lot of feedback indicating that it was difficult to read. So we modified the questions to 5 quick questions and asked in the last question whether they were willing to leave contact information for a more in-depth interview.

After the questions were sent out, we put the survey on a large number of social media

- linkedin, discord, facebook, WhatsApp, instagram, all medical-related groups, and sought professors to forward it
- ask the interviewer to forward the survey to their social network after every interview

but after a lot of effort, the results were not satisfactory. Because our target group is medical experts, many people who do not meet the background did not answer after opening the survey, and some people only answered part of the questions, so the valid data we finally collected was 83 out of 170.

Market size and trends analysis

Secondary data for exploratory analysis

To better launch the Chirp's product into the optimal region from the market, our team took leverage from the secondary data source, mostly data from *Statista*, as well as several trustworthy sources from npj and Pew Research Center. Exploratory analysis was conducted based on the understanding of macro industrial trends. In the customer aspect, our analysis delved into the study showing an uptrend of spending power as well as deteriorative impact from dementia from the aged people.

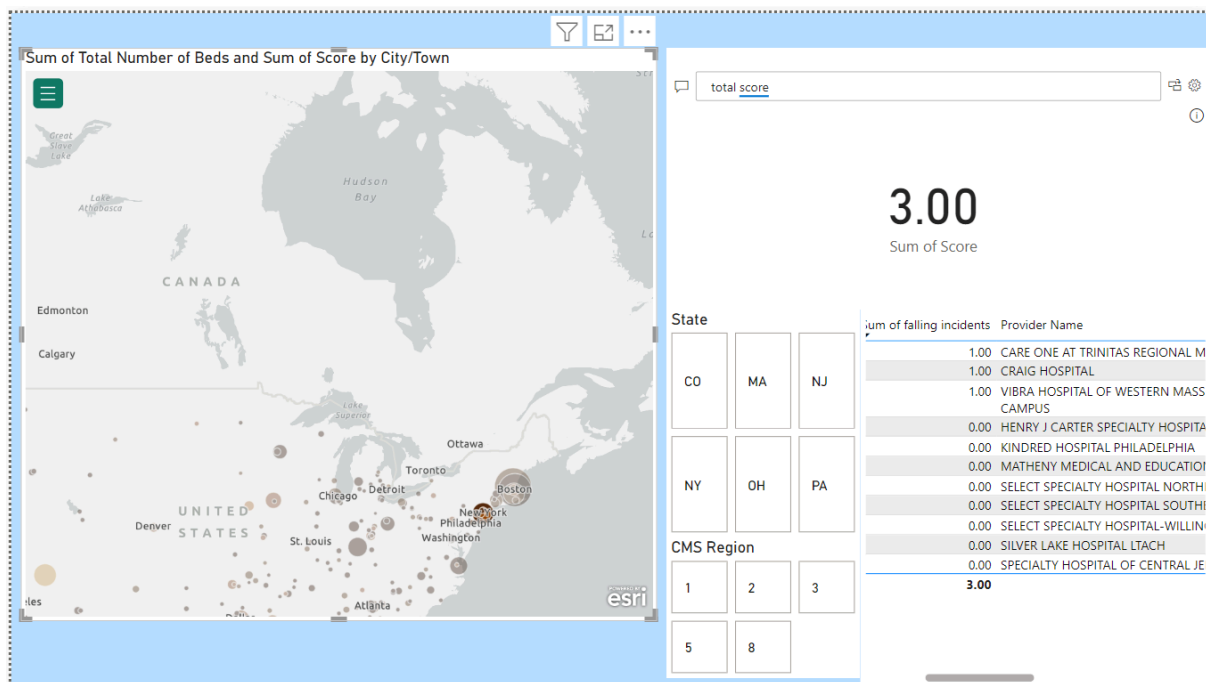
Primary data for market discovery analysis

The primary data source from the Data.CMS.gov, cohesively generating insights based on interpretation of the stories told by the data, that drive future business decisions into profitability.

In terms of the primary research, we cultivate deeply into the study of fall instance injury statistics. In order to make the analysis more useful and interactive in uncovering insights, our team exploited the Power BI dashboard as a tool to convert the plain data into stories and graphs. Initial dataset embedded within the dashboard came from the CMS.gov, the governmental agency that monitors and gauges the long-term-care hospitals (LTCH) at national and individual levels. The dashboard

features can be down to three sections: investigation of regional market size, investigation of regional demand, and the geographical identification of market size. Each has its niche advantage and granularity of telling data patterns from different perspectives.





Overview by Healthcare Sector

There are many different types of falls, such as flat falls, being knocked down by car, neurological falls, pathological falls, and pharmacological falls.

Before go to hospital / nursing home:

Hospitals and nursing homes have many risk assessments such as: the Morse fall scale to evaluate the risk of falls at admission. Rank people by several different risk levels and with different care.

Treatment / housing criterias:

Inperson Monitor:

Patients will have extra care with high risk, such as nurses will check twice an hour. Or in some way they will be required not to leave the bed during the treatment.

Digital Monitor

Some facilities have cameras in the corridor or main gate, depending on the policies individually, and it's also different within general ward, intensive care unit, emergency room, ICU.

And most of them have nursing call systems, and since there will be plenty of people in the facilities, it's rare that a patient falls down but no one is found. They also have push bottoms everywhere in facilities such as the bathroom, restroom and many of them will have wearable devices or in more convenient ways they have mobile phones behind.

Choose highest applicable score from each category		Circle all that apply at the time of this fall
History of falling	No	0
	Yes	25
Secondary diagnosis (More than one diagnosis)	No	0
	Yes	15
Ambulatory aid	None, on bedrest, uses W/C, or nurse assists	0
	Crutches, cane(s), walker	15
	Furniture	30
IV/Heparin lock or saline P.I.D.	No	0
	Yes	20
Gait/transferring	Normal, on bedrest, immobile	0
	Weak (Uses touch for balance)	10
	Impaired (Unsteady, difficulty rising to stand)	20
Mental status	Oriented to own ability	0
	Forgets limitation	15
Total Morse Fall Scale score at the time of fall (high risk >50)		

Post Surgery requirement:

When people take medicine that may cause dizziness or weakness such as: blood pressure medicine, local anesthetic, painkillers, diuretics, or any other different surgery, they will be asked to sit, stand, slow walk, and exercise gradually. And a lot of falls happen after they leave the hospital.

Business Aspect:

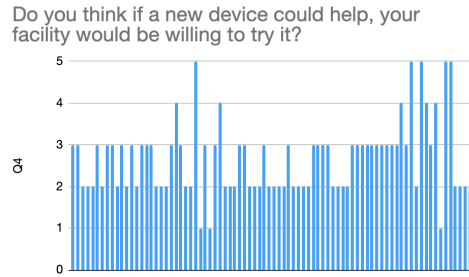
After many investigations, we contacted an orthopedic surgeon who has been in the industry for more than 50 years and has several hospitals of his own. From a comprehensive understanding, from the perspective of hospitals or nursing homes, if an institution wants to introduce new equipment, the most important thing to consider is how much money they will pay or spend if a patient falls in their own facilities. In comparison, if the introduction of new equipment can make it obsolete or solve the problem from its root, how much money can they save out of it?

“If the installation of new equipment can make a profit of at least \$1, then it is acceptable for hospitals or nursing homes to introduce it. If the profit reaches \$10, then they will definitely introduce it.”

Decades ago, the requirement was deemed similar to the introduction of cameras. At that time, the businesses were analyzing aspects of the camera's price, niche of the market they could serve, at what height, and returns on investment. From a consumer perspective, the fundamental principle is nothing else but the profit margins as well as other conditional trade-offs that maximize the fortune out of the investment. The conclusion from the research was deemed highly aligned with our initial hypothesis.

Key Findings & Learnings

Survey on overall trend: In our survey among health professionals, attitudes toward innovations were generally moderate, and it was perceptible that the preference was given to traditional and conservative practice over state-of-the-art technologies. Hence, for many professionals, it is hard to realize technical innovations. Their main interest, however, remains the improvement of methods and results of treatments. Such orientation points to the very need, indeed, for balancing on the one hand the progress in technology with actual pragmatic improvements in the quality and efficiency of treatment in health care.



1: Definitely not, 2: Probably not, 3: Might or might not, 4: Probably yes, 5: Definitely yes

Balance in human interaction: When conducting the analysis of remote patient monitoring (RPM) as well as the satisfaction survey and acceptance level interviews and suggestions, we got suggestions from professionals, for example, although new technologies and technologies can greatly improve client security and First-time alerts and speed in getting help, but come with many issues such as replacement of personal care. Because for most patients, personal care is a necessary part of the patient's life. To achieve a wonderful balance in human interaction, we need human interaction and caregiver interaction to improve client satisfaction and humane services. It is the client's satisfaction key driver.

Patient Satisfaction and Risk Assessment: So we conclude that the challenge facing remote patient monitoring (RPM) is that after the actual replacement of equipment is implemented, human interaction will be greatly reduced, thereby reducing the experience and satisfaction of many patients. At the same time, replacing new equipment requires considering the cost of manual training to use the new equipment, as well as the cost of patients and all staff adapting to the new equipment. At the same time, new technology brings some side effects, such as injuries caused by machine failure when no one is patrolling, and also the cost of not getting timely medical attention. At the same time, whether the cultivation of this new technology will cause problems for existing employees requires careful cost calculation and risk control under long-term development.

Relationship between caregivers and patients: At the same time, the initial cost will become one of the deciding factors for adopting new technologies, although the implementation and upgrading of new technologies are very important. However, after the need for face-to-face interaction decreases, the relationship between caregivers and patients will have an impact, because the relationship between caregivers and patients is still irreplaceable. When people choose to pay for care, they receive AI monitoring, which will make some people feel dissatisfied.

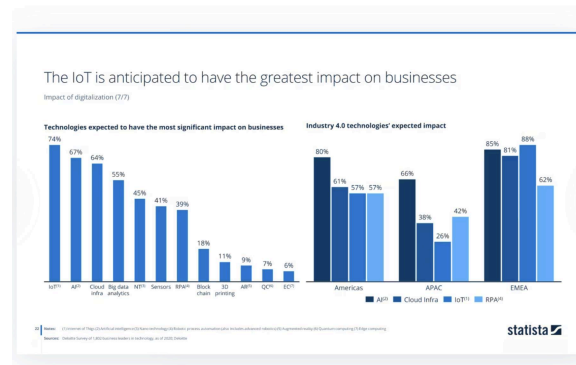
Data privacy and treatment accuracy: At the same time, with the application of new technology industries in medical care, new problems have arisen. Data privacy and treatment accuracy will become a big controversy. Clients and medical staff will have questions about who collects the data and whether the data is only used in certain places, and how can we prove and ensure the security of the data, especially in Very

sensitive health care industry. Therefore, it is very important to protect patient data, and how to make patients trust the supervision that can protect data is also a big problem. In an era of increasingly advanced technology, compliance and enforcement in the legal and safety sense have become complex.

Functional diversity and detailed user manual: From the feedback provided by healthcare professionals in the interview, it can be learned that nurses will work in many different environments, such as hospitals, home care, and travel nursing, so the RPM formulation must be diverse to meet different situations. The following customer special requirements. Particularly in institutions that lack specialized departments such as dementia care, which we had the opportunity to have one-to-one discussions with, because for them they developed a toolbox based specifically on dementia patients, from They have learned what patients really need based on decades of experience in the industry, and have continuously improved upon implementation and promotion. At the same time, issues such as falls and pressure injuries remain challenges for patients after they are discharged from the hospital, providing opportunities for innovation in Chirp's prevention and response strategies.

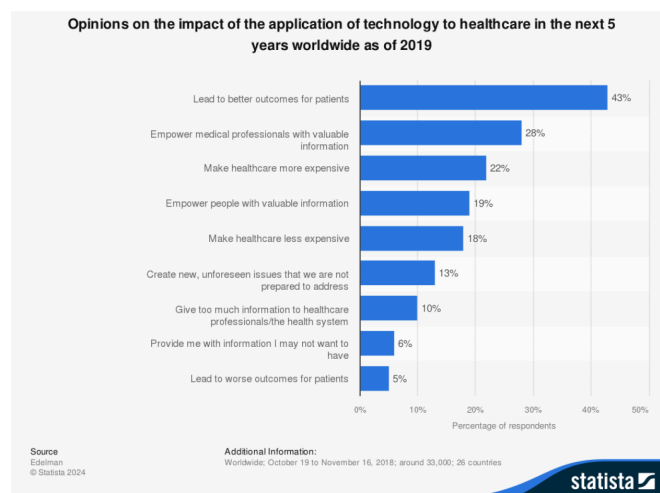
Decision-making process: With expert advice, the decision-making process for purchasing a new system is very complex and long. For example, budget allocation and the roles involved, the impact on people, the control of risks and the consequences of bearing on them are all crucial. In traditional nursing homes, patients wear wearable devices such as callers around their necks or wrists and other monitoring technology in certain areas. But after the development of technology this year, people prefer portable devices such as mobile phones and watches as calling devices. At the same time, they do not have to bear extra costs. But from another perspective, many patients, especially elderly patients, are more willing to accept After new technologies, they are more willing to purchase additional equipment for themselves to ensure the convenience and safety of life. At the same time, they are more willing to accept new technologies than other groups, provided that these products can provide value and enhance user experience.

Exploratory Market Analysis: Assessing Healthcare's Technological Shift



Through research on the market, one undeniable fact is that the healthcare industry is in a stage of interruptive technological renovation. More and more technologies are emerging, taking over the market. More and more overall market opportunities have presented, which means more new equipment has been invested. Market use. The Internet of Things (IoT) encompasses a variety of medical technologies including remote patient monitoring equipment, precision surgical instruments, technology, and more. In a survey of business leaders, 74% believed that IoT will have a significant impact. This is further confirmed by healthcare professionals, with 43% agreeing that technology will significantly improve the quality of care.

We can see a very positive improvement in the medical industry, through technologies such as artificial intelligence (AI) and cloud infrastructure that have the potential to provide valuable information to healthcare professionals, as well as improvements in care capabilities and quality of service, people will. The innovation of technology in the medical industry is placed in a positive position.



But the problem with the introduction of new technologies is that people in the healthcare industry will worry about the risks and unpredictable problems caused by excessive digitalization, especially in the very sensitive aspects of human health,

which will also lead to higher medical costs or increased contradictions, because Any mistake will be fatal.

The Unyielding Challenge of Dementia and its Impact on Social Care Budgets

As our population ages, we're confronted with a variety of chronic diseases that predominantly affect the elderly, such as arthritis, diabetes, heart disease, and cancer. However, Alzheimer's disease stands out due to its profound impact on the quality of life of our senior citizens. This condition not only incapacitates individuals, rendering them unable to contribute to society, but it also places a significant burden on state resources. Despite the considerable healthcare budget allocated to other ailments, Alzheimer's disease remains without an effective cure or treatment, leading to a steady decline in patients. This situation results in substantial costs and impacts worldwide, as the disease leads to complete incapacitation without the prospect of a cure, and sufferers often live for many years before passing away. Consequently, the demands on health and social care systems are exceedingly high. In the United States alone, there are currently 5 million individuals living with Alzheimer's, a number projected to rise to 16 million by 2050 due to an aging population and the increasing prevalence of the disease. Although treatments for dementia are anticipated to emerge in the next 5-10 years, they will likely come with significant costs and further strain healthcare spending. Nevertheless, the development of effective treatments would mark a significant improvement for an aging global population, as keeping more people active and contributing to society would alleviate some of the burdens faced by developed countries with shifting demographics. It is imperative for the well-being of our consumer group and the economy that these health issues and expenses are managed more effectively, lest they consume the majority of state and private wealth in the health sector.

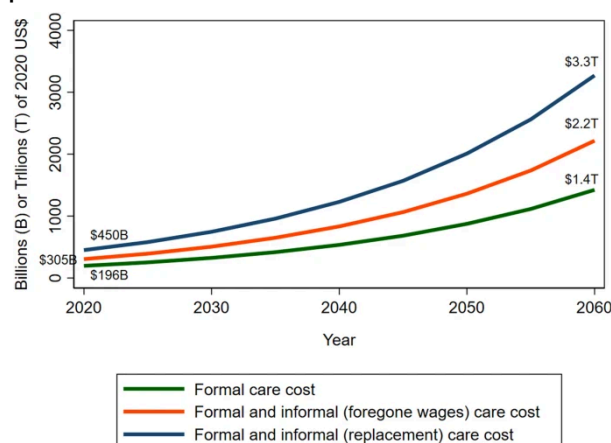
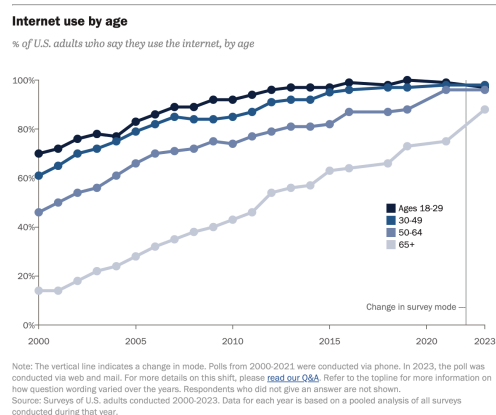


Figure 1 presents the future projections of care cost (2020 US\$). Under the base case scenario, the annual aggregate formal care cost for ADRDs was an estimated \$196 billion (95% uncertainty range [UR]: \$179–\$213 billion) in 2020 and was projected to increase to \$1.4 trillion (95% UR: \$837 billion–\$2.2 trillion) by 2060. Aggregate formal and informal care (replacement method) cost was estimated to increase from \$450 billion (95% UR: \$424–\$478 billion) in 2020 to \$3.3 trillion (95% UR: \$1.9–\$5.1 trillion) in 2060. Aggregate formal and informal care (foregone wages method) cost was estimated to increase from \$305 billion (95% UR: \$278–\$333 billion) in 2020 to \$2.2 trillion (95% UR: \$1.3–\$3.5 trillion) in 2060.

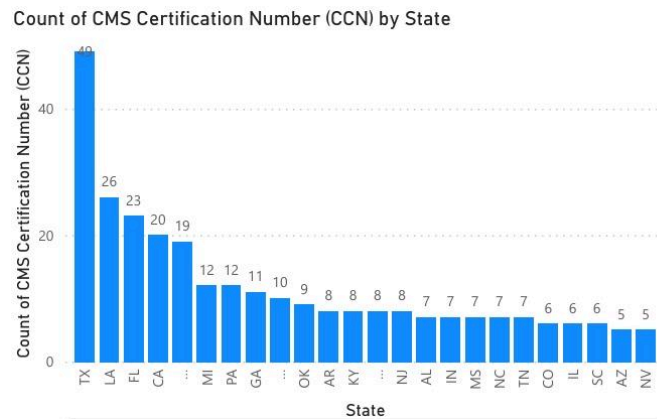


Elderly individuals are increasingly embracing technology, with a growing number of seniors becoming proficient in using the internet for various purposes. This trend presents numerous opportunities for businesses targeting this demographic, provided they adapt their offerings to meet the preferences and aspirations of this age group. As societies age and the demographic makeup shifts, new industries are emerging to provide care solutions, with technology playing a crucial role. However, the potential extends beyond care, as there are various emerging technology sectors that should cater to an older demographic that possesses greater spending power, owns property, and has ample leisure time compared to younger generations like millennials.

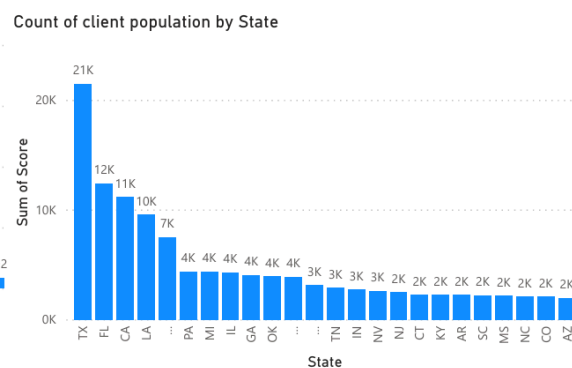
Long Term Care Hospital Provider Data: Identifying high-stake regions related to market size discovery by state level

After posting with the information related to the macro industry trend, it is better to zoom in the area of expertise where Chirp operates in: falling detection and proactive prevention. By doing research based on the datasets tracking long-term care hospitals from the governmental data(Centers for Medicare & Medicaid Services Data(.gov)¹), our team identified the top areas having the most frequent falling incidences, potentially implicating higher market demand. The measure took account of the numbers of facilities(CMS certification number) participating in the study, aggregated through the year span of 2022-2023. Since the dataset employed is from the governmental dataset, our team trusts firmly that the credibility and the granularity within the dataset could lead to an evident outcome, showcasing explicitly the total client population as well as the population of clients experiencing fall incidents on the facility level.

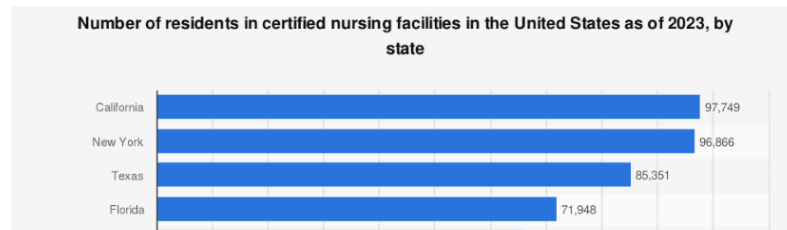
¹ <https://data.cms.gov/provider-data/topics/long-term-care-hospitals/about-using-government-data>



To start with the market size analysis, we conducted summary statistics that gave a sense of the total size of hospitals in the state. Given that each CMS certification number identifies one institute, we discovered that Texas topped with the most numbers of long term care institutes (49 headcounts), followed by Louisiana with almost half of that amount. It is worth noticing that the top three tiers were dominated by the MiddleSouth regions so that it could shed light on introducing potential geographical pilots for providers within such regions. Nonetheless, potential drawback exists from using the absolute numerical value for the population count, due to the negligence of state population as a baseline, that highly matches the amount of healthcare facilities allegedly required to sustain the entire state population. It also should be aware that the distribution of LTCH count might fall under the systematic bias of the dataset. Thus our team conducted external research based on national data to qualify for a holistic overview of the market. In terms of the national inspection, we found the outcome seems mostly approaching our analysis from the independent data, exemplified from the second following analysis.

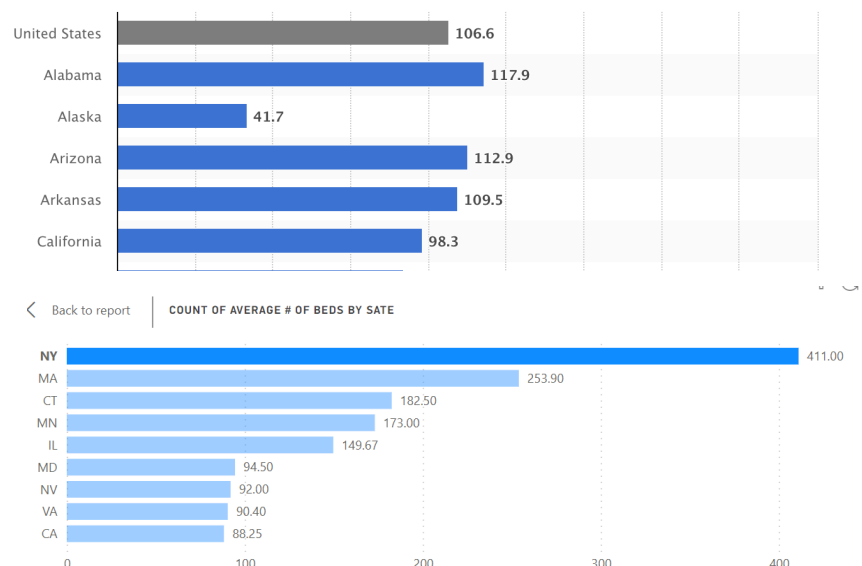


In the second part, we have identified the total population of housing residents through the year 2022-2023 per state. The outcome seems like a resemblance from the previous facility count interpretation.



To further prop up the authority from our research's outcome, another external search from the *Statista* data² was investigated. We found similar patterns that further reinforced our statement, in which the top states with the number of residents in certified nursing facilities fall under California, New York, Texas, and Florida. Therefore, the national data validated most part of the outcomes captured from our primary research.

Another useful measure to account for potential market size is the count of average bed amounts per facility by each state.

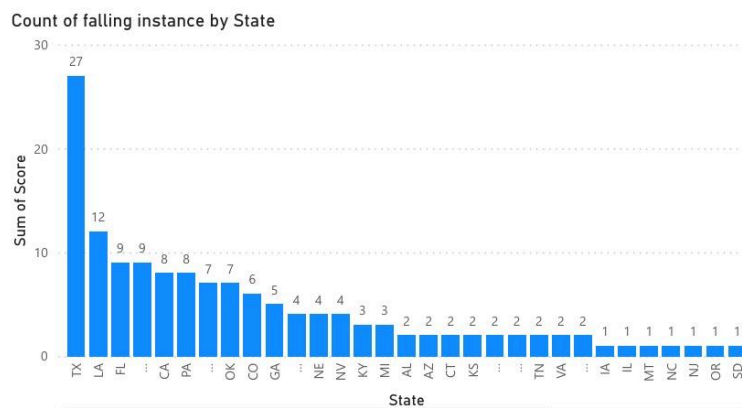
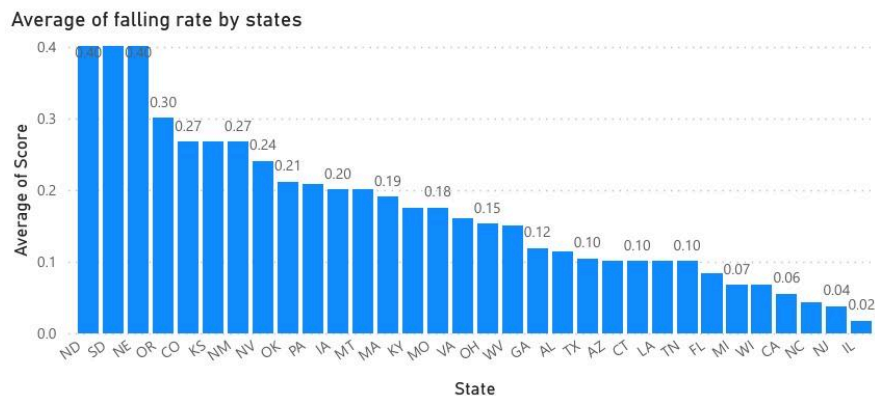


Referring to the third-source data from *Statista*, our team identified Alabama, Alaska, and Arizona as the top 3 prioritized states with the most averaged bed headcount. Counterfactually, our primary research yields different outcomes which leads to New York, Massachusetts, and Connecticut being the top 3 positions. The divergency can be attributed to the bias of sample selection within the governmental data, namely more surveys and documentation were conducted for Eastern states across the nation.

Followed by the summary statistics, the study shifted focus onto the clinical metrics, which intuitively speaks off the quality and share of service provided by the facilities in general.

² Refer to appendix item No.2

Based on the analysis, North Dakota, South Dakota and Nebraska come to be the top three tiers off the chart, tied up with a score of 40%, implicating worse quality of service level than average U.S. facilities.



Last but not least, we have the falling incidents counted by state. Remarkably enough, Texas had experienced a higher-than-average amount of falling, in comparison with Louisiana and other major cities that carry large amounts of long term care facilities. The overwhelming size of falling incidents in Texas can be attributed to the large magnitude of population within the state (nearly 30 millions).

Conclusion

With some takeaways, our team discovered the following facts based on the study: the United States had major middleSouth regions dominantly clustered with Long Term Care Hospitals, whereas in the East and West coasts had New York and California presenting large potential market share awaiting to be penetrated. Chirp should highly consider pivoting through the identified market segments progressively with strategies that make the market beneficial without suffering from high cost margins.

The survey results are obvious. For the introduction of new technologies and their widespread use, there are many issues involved, such as the improvement of personnel efficiency brought by technological innovation, the accompanying nursing training and the use and adaptation costs of new technologies for labor and patients. As well as initial costs, these are all issues that need to be considered, as well as technology and customer satisfaction, workforce replacement, data security and regulatory issues that need to be addressed. Finding a balance between these is crucial.

Resources

1. online survey template
https://uwmadison.co1.qualtrics.com/jfe/form/SV_4SmA0qpRx9GeVj8
2. survey result
https://docs.google.com/spreadsheets/d/1bcw7JhhbJGTbt97-MwuZNeA2i9uYEQWzzVQw0_T-WV8/edit#gid=1946312448
3. interview1, Orthopedic surgery specialist
https://docs.google.com/document/d/1-8FCdz9hr5_Exo7zla1fFvi1K44ymButHAabcSu5qco/edit?usp=sharing
4. interview2, Interim UW CIPE Director
<https://docs.google.com/document/d/1F1bF0x-48eJmACejHinKoP4-MgO-oPsXUe3BPYPulJA/edit?usp=sharing>
5. interview3, Outreach Specialist for the School of Nursing's Center for Aging Research and Education (CARE)
https://docs.google.com/document/d/1GUteAtFQJxOtGhWuRy8Q8x7cQK19mY55ODm_4RYy8l8/edit?usp=sharing
6. interview4, Clinical Nurse
https://docs.google.com/document/d/15c8-Rvik-p_ybYid2M_3qcwNwtak2UE17tJ1SqctjGA/edit?usp=sharing
7. interview5, Co-Coordinator of the UW IPE Healthy Aging Initiative
<https://docs.google.com/document/d/1ibky0bUTXjz3yuZCjGuS0sn7xHiVDbwwcDsLxotwqaM/edit?usp=sharing>
8. interview6, orthopedic surgeon
<https://docs.google.com/document/d/1Z2vUO09TfVjqJqkGeOt7ULDDO9vZfn7Vxy2cm2CayYw/edit?usp=sharing>
9. Market statistics chart 1:
<https://www.statista.com/study/66974/in-depth-report-industry-40/>
10. Market statistics chart 2:
<https://www.statista.com/statistics/1073292/opinions-on-impacts-of-technology-application-to-healthcare/>
11. Market statistics chart 3:
<https://www.statista.com/statistics/276293/total-revenues-of-american-and-european-medical-technology-companies/>
12. Cost of care for Alzheimer's disease and related dementias in the United States: 2016 to 2060: <https://www.nature.com/articles/s41514-024-00136-6>
13. Internet, Broadband Fact Sheet:
<https://www.pewresearch.org/internet/fact-sheet/internet-broadband/?tabId=tab-9a15d0d3-3bff-4e9e-a329-6e328bc7bcce>