CONTINUOUS SKILLED NURSING BIENNIAL REPORT

COMMONWEALTH OF MASSACHUSETTS
ACTS OF 2019
CHAPTER 41, SECTION 11

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Prepared for:
Commonwealth of Massachusetts,
Center for Health Information and Analysis,
in Conjunction with MassHealth

BerryDunn

CHIA.

Continuous Skilled Nursing Biennial Report

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1.0 Executive Summary

The fiscal year 2020 budget (Massachusetts Acts of 2019, Chapter 41, Section 11) amends Chapter 12C of the General Laws by adding Section 24. Section 24 requires the Center for Health Information and Analysis (CHIA), in conjunction with MassHealth, to provide a "biennial report on the provision of continuous skilled nursing [CSN] care as defined in 101 Code of Massachusetts Regulations (CMR) 361."[1] The eight questions this biennial report is required to address include an assessment of the degree to which hours of care authorized for CSN are delivered, and an evaluation of reimbursement rates for CSN and the related wage levels for nurses relative to the wage rates paid to all Commonwealth of Massachusetts (Commonwealth) nurses. CHIA retained BerryDunn to assist with conducting the study.

Registered nurses (RNs) and licensed practical nurses (LPNs) provide CSN care to pediatric and adult patients who have complex medical needs. CSN provides skilled nursing needs for certain patients with complex medical needs in their home. Patients often have medical equipment and treatments that might require RNs and LPNs to have special training. RNs and LPNs are contracted by MassHealth as independent nurses to provide CSN care, or they are employed by Home Health Agencies (HHAs) who contract with MassHealth to provide CSN. Regulations determine compensation for independent nurses and HHAs, and HHAs then determine the rates paid to nurses they employ.[2]

MassHealth provided BerryDunn with data pertaining to the population of children and adults receiving CSN care, notably the average and median CSN care authorized and utilized hours per day, week, month, and year across all patients, as well as the total hours authorized and utilized by month and year for each pediatric and adult patient. In order to evaluate the adequacy of CSN care staffing levels and nurse wages in the Commonwealth, BerryDunn utilized the data provided by MassHealth, publicly available data from the United States Bureau of Labor Statistics (BLS), and responses to a survey of HHAs that contract with MassHealth to deliver CSN care in the Commonwealth conducted by BerryDunn as part of the study.

BerryDunn's analysis found that between a quarter and a third of authorized CSN care hours for adult and pediatric patients are not utilized.[i] In response to an inquiry about the reasons hours go unfilled, MassHealth indicated the many reasons are complex and multifactorial (see Appendix B[3]). BerryDunn's survey of the 20 HHAs that provide CSN in Massachusetts resulted in six responses representing slightly over half of all CSN service volume. Five of the six responding HHAs cited lack of nurse availability as the primary reason for unmet demand, a problem exacerbated by the complexity of achieving workable matches for patients receiving CSN care. Successful care of patients receiving CSN requires nurses who match both the clinical needs of the patient and the interpersonal needs of each patient and their family[4] making the task of matching nurses with patients and families challenging.

The shortage of appropriately qualified nurses available to provide CSN care might be associated with CSN reimbursement rates. BerryDunn's analysis found that average wages for RNs in Massachusetts, after adjusting for inflation based on the year for which data were available, are comparatively higher than those for nurses providing CSN care who either contract directly with MassHealth or are employed by an HHA. This apparent difference is less

[i] See Exhibits 5, 6, and 7 in Section 2.3.4 of the body of this report.

pronounced for LPNs. However, financial compensation is only one factor, of many, that contributes to a nurse's decision to choose a particular patient population and setting. Independent nurses rated several other attributes as more important than rate of pay in response to surveys administered for MassHealth in 2017, although rate of pay was rated the most influential factor for remaining an independent nurse (see Appendix C). In a parallel survey of HHAs, the four most significant challenges for providing CSN care all related to finding an appropriate patient match on a long-term or situational basis, and reimbursement rate was cited as the most of important influencer on their continued participation (see Appendix D). Increased reimbursement for CSN care might improve availability of nurse staffing and fulfillment of authorized hours, but the complexities of nurse-patient matching, HHA wage rate decisions, and nurse choice of employment setting will remain factors affecting the supply of nurses for CSN care.

2.0 Continuous Skilled Nursing (CSN) Care in Massachusetts

2.1 Introduction

The fiscal year 2020 budget (Massachusetts Acts of 2019, Chapter 41, Section 11) amends Chapter 12C of the General Laws by adding Section 24.[ii] Section 24 requires the Center for Health Information and Analysis (CHIA), in conjunction with MassHealth, to provide a "biennial report on the provision of continuous skilled nursing care as defined in 101 CMR 361.[iii]"

CHIA retained BerryDunn to assist with conducting the study.

Section 24 specifically requires CHIA to address eight complex questions related to the provision of CSN care in the Commonwealth for both the pediatric and adult population:

1. The number of pediatric and adult patients requiring CSN
2. The average and median number of CSN hours authorized by MassHealth per day, week, month, and year for pediatric and adult patients
3. The average and median number of authorized CSN hours actually delivered per day, week, month, and year for pediatric patients and adult patients
4. The total number of CSN hours authorized and actually delivered by MassHealth per month and year for pediatric patients and adult patients
5. The number of nurses providing CSN care to more than one patient at a time and, for the patients cared for by those nurses, the aggregate proportion of authorized CSN hours to utilized CSN hours
6. The number of nurses who contract with MassHealth to provide CSN care, the number of nurses who provide CSN care through a home health agency (HHA) that contracts with MassHealth and whether the total number of nurses providing such care is sufficient to fill all authorized CSN hours
7. A description of the training, experience, and education levels of the nurses who contract with MassHealth to provide CSN care
8. An evaluation of the adequacy of the reimbursement rates for CSN care as established in 101 CMR 350.04(2)[iv] paid to nurses who contract directly with MassHealth to provide CSN care, and a comparison of those rates against:
    a. The portion of the reimbursement rate paid directly as wages to nurses providing CSN care through an HHA that contracts with MassHealth
    b. The median wage rate paid to all nurses in the Commonwealth

[ii] The full text of the study requirements, as they are provided in the Acts of 2019, Chapter 41, Section 11—making appropriations for fiscal year 2020—can be found in Appendix A.

[iii] 101 CMR 361 defines continuous skilled nursing care as "a nurse visit of more than two continuous hours of nursing services."

[iv] 101 CMR 350.04 establishes rates for payment for home health services in the home. 101 CMR 361.04 sets forth the rates of payment for CSN Services in the Home. For the purposes of this report, the rate comparisons are to those set forth in 101 CMR 361.04.

2.2 Background

CSN care enables pediatric and adult patients with complex chronic health problems to receive nursing care at home. CSN is defined as a nurse visit of more than two continuous hours of nursing services.[v] As a service administered by MassHealth, CSN is provided to eligible publicly aided individuals[vi] regardless of the type of program (e.g., waivers) under which MassHealth is purchasing the services. As a prerequisite for the provision of CSN services, a member must be determined to be clinically eligible based on criteria set forth in 130 CMR 414.08.[vii] Each nurse providing CSN care must be a registered nurse (RN) or a licensed practical nurse (LPN).[viii] Nurses provide CSN care either through a direct contract with MassHealth as an independent nurse or through employment at a HHA.[ix]

As a condition of payment for CSN services, a prior authorization (PA) must be obtained from the MassHealth agency or its designee before services are rendered to a member.[x] PAs typically authorize care for a year although the authorized duration of services can vary.

MassHealth's designee for CSN care PAs is the University of Massachusetts Medical School Commonwealth Medicine Community Case Management (CCM) Program. The CCM Program is a partnership between MassHealth and Commonwealth Medicine and was established in 2003 to coordinate care for medically complex children and young adults.[xi] In 2013, MassHealth expanded the program to members of all ages who qualify.[xii] As a result, the CCM Program processes all provider referrals for CSN care, both pediatric and adult. Children and adults with medical complexity are referred to as complex-care members.[xiii] The care management services provided by the CCM Program includes service coordination with HHAs as appropriate to meet the individual needs of complex-care members.[xiv] Without CSN care provided in the home, a portion of these complex-care members would need to seek equivalent care in an institutional setting.

Complex-care members face disability and other medical vulnerabilities, and are frequently dependent on technology; therefore, many complex-care members require intensive care coordination in order to achieve optimal

[v] 101 CMR 361.02 definition of Continuous Skilled Nursing Care.

[vi] Pursuant to 101 CMR 361.02, a Publicly Aided Individual is "a person who received health care and services for which a governmental unit is in whole or part liable under a statutory program."

[vii] A member is clinically eligible for MassHealth coverage of CSN services when all three of the following criteria are met: 1) there is a clearly identifiable, specific medical need for a nursing visit of more than two continuous hours; 2) the CSN services require the skills of a registered nurse or of a licensed practical nurse in accordance with 130 CMR 414.408(B); and 3) the CSN services are medically necessary to treat an illness or injury in accordance with 130 CMR 414.409(D).

[viii] 130 CMR 414.02 defines a Nurse as a person licensed as a registered nurse or a licensed practical nurse by a state's board of registration in nursing.

[ix] 130 CMR 414 states the requirements for nurses who contract with MassHealth as an independent nurse, and 130 CMR 403 sets forth the HHA requirements.

[x] 130 CMR 414.41 sets forth the eight prior authorization requirements necessary for the provision of CSN services.

[xi] The CCM Program coordinates community long-term services and support (LTSS) for MassHealth members with complex medical need and their caregivers.

[xii] Commonwealth Medicine News. September 1, 2016.

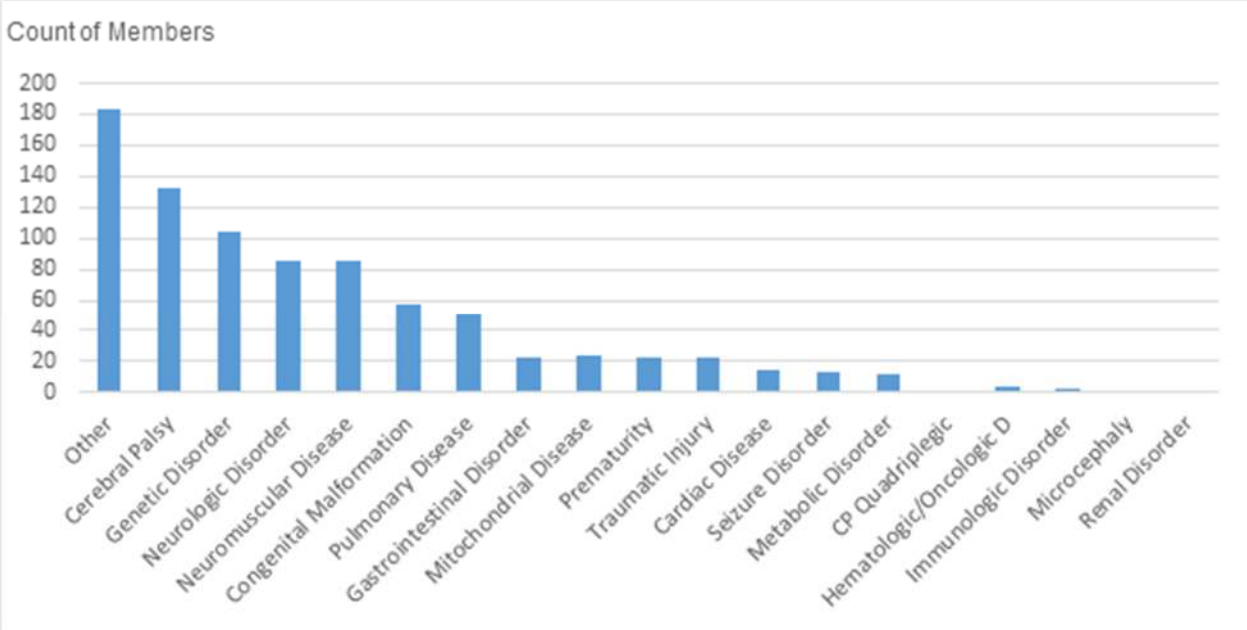
[xiii] 130 CMR 414.402 defines Complex-Care Member as a MassHealth member whose medical needs, as determined by the MassHealth agency or its designee, are such that he or she requires a nurse visit of more than two continuous hours of nursing services to remain in the community.

[xiv] 130 CMR 403.412 Complex-Care Members.

outcomes.[5] The pediatric complex-care member population is growing as a result of medical improvements in care that have led to a substantial increase in the number of children surviving previously fatal complex conditions.[6]

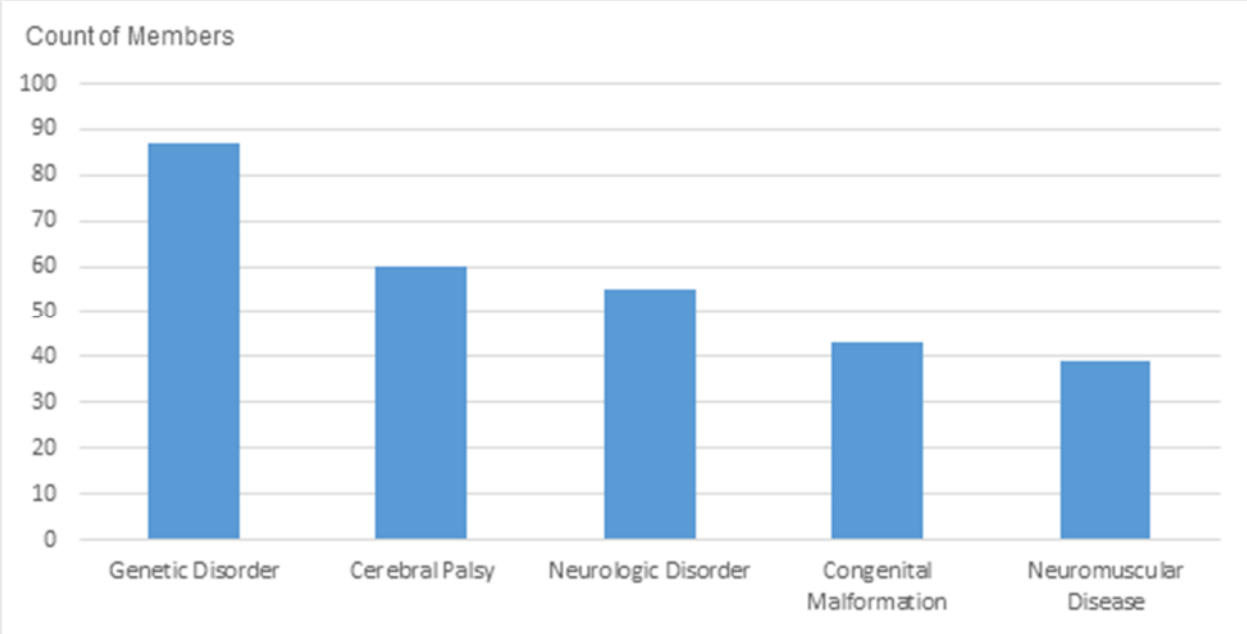
Complex-care members may have multiple and varied diagnoses. Children frequently have a congenital or acquired multisystem disease, a severe neurologic condition with marked functional impairment, and/or technology dependence for activities of daily living.[7] For this analysis, the CCM Program provided diagnoses for all currently enrolled patients as well as the top-five diagnostic categories for children receiving CSN services; a summary of this information is displayed in Exhibits 1 and 2.

Exhibit 1: Primary Diagnosis for All Enrolled Members[xv]



[xv] Member distribution by diagnoses provided by the CCM Program.

Exhibit 2: Top 5 Primary Diagnoses for Currently Enrolled Pediatric Patients



Although patients may share the same diagnosis, they often have different presentations and individual needs. The CCM Program develops care management plans based on specific needs of patients for optimal health and well-being including, but not limited to: physical therapy, medical equipment and supplies, medical specialists, and home/personal care support.[8] Prior to the CCM Program expansion in 2013, children aged out of the CCM Program at age 22, but now patients can stay in the program into adulthood. The CCM Program coordinates home- and community-based services for over 800 patients in Massachusetts who receive CSN care annually.

The remainder of this report is organized to follow the sequence of questions set forth in the Section 24 requirements of the biennial report.

2.3 Section 24 Requirements

2.3.1 Number of Pediatric and Adult Patients Requiring CSN Care

This section of the report provides the number of pediatric and adult patients requiring CSN care. MassHealth provided relevant data for two periods: July 1, 2016, through June 30, 2017 (referred to hereafter as "prior period"); and July 1, 2017, through June 30, 2018 ("current period").

Patients were identified for inclusion in the total count for either the prior or the current period if they had a PA with an effective date that fell within either of those years. For the purposes of this study, pediatric patients are defined as individuals under 21 years of age, while adults are defined as being 21 years of age or older.[xvi] The number of

[xvi] Age is calculated as of the first day of the measurement period.

pediatric and adult patients who had authorized hours beginning in prior or current periods is shown in Exhibit 3 below.[xvii]

Exhibit 3: Number of Pediatric and Adult Patients with a PA for CSN[9]

TIME PERIOD	AGE GROUP	NUMBER OF PATIENTS
Prior Period*	Adult	261
Prior Period*	Pediatric	587
Current Period**	Adult	273
Current Period**	Pediatric	556

*Prior Period: July 1, 2016 – June 30, 2017
**Current Period: July 1, 2017 – June 30, 2018

The number of adult and pediatric patients receiving CSN care remained relatively stable between the prior and current periods. A portion of these patients represents individuals who may qualify for institutional-level care.[xviii]

Of the 294 adult patients currently enrolled (see Exhibit 4), 145, or approximately 49% percent, have been in the program for several years and were pediatric patients when they first enrolled. This is best illustrated in Exhibit 4, which presents the age range of members when initially enrolled in the program as well as their current age.

Exhibit 4: Individual Members Age at Enrollment and Current Age[xix,10]

AGE RANGE	NUMBER IN AGE RANGE AT ENROLLMENT	NUMBER IN AGE RANGE CURRENTLY
0 – 5	436	163
6 – 10	116	151
11 – 15	78	116
16 – 20	60	115
21 – 64	138	278
65+	11	16
Total Members	**839**	**839**

[xvii] For purposes of this study, Procedure Codes – T1002, T1003 were used by MassHealth to identify members and determine authorized and utilized hours.

[xviii] 130 CMR 519.001 MassHealth Coverage Types.

[xix] 2019 current member enrollment data outside of the measurement periods used for this study provided by the CCM Program.

2.3.2 CSN Care Reported Average and Median Authorized and Utilized Hours

The study requires reporting the average and median number of CSN hours authorized by MassHealth and actually delivered per day, week, month, and year for pediatric and adult patients. PAs are granted for extended periods, often for a full 12-month period and sometimes longer. During the PA period, MassHealth modifies the number of authorized hours approximately 84% of the time.[11] The MassHealth data system only captures the final modified hours, and historical adjustments are not reportable. Since a PA can be effective on any calendar day, the data are grouped into two 12-month periods. From its data systems, MassHealth pulled authorized and utilized hours for all PAs with an effective date in the prior period and the current period. This approach eliminated the need to allocate hours between calendar periods and better-aligned authorized and utilized hours.

MassHealth's PA process does not proscribe how much or when authorized hours can be used in a given day or week, but rather provides a total amount of authorized hours over the PA period, MassHealth Authorized hours are determined by the PA period, which is generally about 12 months, although this time may vary. Because MassHealth does not authorize hours by day or week, or month, in order to determine estimates for authorized hours by day, week, and month, this analysis took the total authorized hours for the PA period and divided the hours into month, week, and then day segments. Because the PAs total authorized hours represent the final authorized amount, and given the frequency with which CSN PAs are modified, it should be understood that these estimates do not represent the actual number of hours a member was authorized for CSN services on any given day, week, or month during the PA period.

BerryDunn included PAs with an effective date in the prior period, with no restriction on the end date, and in the current period, with an end date that did not exceed July 31, 2019 (12 months after the end of the Current Period). Exhibits 5 and 6 present the total authorized hours, total utilized hours, and the average and median authorized and utilized hours per day, week, month, and year for pediatric and adult patients.

Exhibit 5: Pediatric Authorized and Utilized Hours – Age <21 Years[xx,12]

	PRIOR PERIOD*		CURRENT PERIOD**	
METRIC	ESTIMATED AUTHORIZED	UTILIZED	ESTIMATED AUTHORIZED	UTILIZED
Day – Average	5.94[xxi]	2.95	4.51	3.00
Day – Median	3.44	2.18	3.57	2.27
Week – Average	31.99	20.66	31.48	20.93
Week – Median	24.07	15.19	24.97	14.88
Month – Average	132.42	88.58	135.59	90.35
Month – Median	102.75	63.00	108.55	65.71
Year – Average	1,127	773	1,192	818
Year – Median	541	333	641	361
Year – Total Hours	**1,890,805**	**1,297,596**	**1,780,196**	**1,221,067**

*Prior Period: July 1, 2016 – June 30, 2017
**Current Period: July 1, 2017 – June 30, 2018

[xx] The difference between authorized and utilized hours may be due to a number of reasons, including a modification, within the authorization period, of the total number of authorization hours. The MassHealth data system only captures the final modified hours. See Appendix B for staffing-related reasons.

[xxi] The authorized days in the Prior Period contains an apparent anomaly for one case that results in an inflated value for this cell.

Exhibit 6: Adult Authorized and Utilized Hours – Age 21 or Greater[xxii,13]

	PRIOR PERIOD*		CURRENT PERIOD**	
METRIC	ESTIMATED AUTHORIZED	UTILIZED	ESTIMATED AUTHORIZED	UTILIZED
Day – Average	5.18	3.63	6.26	3.19
Day – Median	3.90	2.91	3.57	2.29
Week – Average	36.24	25.35	43.54	22.31
Week – Median	27.24	19.81	25.07	16.00
Month – Average	159.93	110.91	158.38	95.83
Month – Median	119.38	86.58	107.42	66.67
Year – Average	1,322	949	1,306	890
Year – Median	487	379	526	332
Year – Total Hours	**1,085,369**	**779,026**	**1,090,122**	**742,912**

*Prior Period: July 1, 2016 – June 30, 2017
**Current Period: July 1, 2017 – June 30, 2018

2.3.3 CSN Care Total Authorized and Utilized Hours

This section of the report provides a summary of the total number of CSN care hours that were authorized and utilized per month and year for the prior and current periods.

[xxii] The difference between authorized and utilized hours may be due to a number of reasons, including a modification, within the authorization period, of the total number of authorization hours. The MassHealth data system only captures the final modified hours. See Appendix B for staffing-related reasons.

Exhibit 7: Total CSN Authorized-to-Utilized Hours[xxiii,14]

AGE GROUP	MEASUREMENT PERIOD	TOTAL HOURS AUTHORIZED MONTH	TOTAL HOURS UTILIZED MONTH	RATIO AUTHORIZED-TO-UTILIZED HOURS	TOTAL HOURS AUTHORIZED YEAR	TOTAL HOURS UTILIZED YEAR	RATIO AUTHORIZED-TO-UTILIZED HOURS
Pediatric	Prior Period*	222,202	148,644	67%	1,890,805	1,297,596	69%
Adult	Prior Period*	131,306	91,056	69%	1,085,369	779,026	72%
Pediatric	Current Period**	202,437	134,886	67%	1,780,196	1,221,067	69%
Adult	Current Period**	132,247	80,019	61%	1,090,122	742,912	68%

*Prior Period: July 1, 2016 – June 30, 2017
**Current Period: July 1, 2017 – June 30, 2018

The ratio of authorized-to-utilized hours remained at 69% for pediatric patients in both prior and current periods. For the adult population, there was a 4% decline from the prior period to the current period—72% to 68%.

MassHealth requires PA in order to reimburse claims for CSN services. Based on information received from the CCM Program, the number of CSN services authorized per member and the proportion of authorized services utilized per member can vary widely across the CCM Program population. This gap in delivered services is due to a variety of factors, as discussed below.

2.3.3.1 Independent Nurse Unfilled Authorized Hours

Many reasons might contribute to why authorized hours might not be utilized, including, but not limited to: shortage of nurses in the member's geographic area who meet their individual medical needs and personal preferences; members refusing to receive CSN services from specific HHAs and independent nurses due to previous histories or personal preferences; members deciding not to fill all of their authorized hours; the nurse becoming unavailable due to illness; or a member being new (under three months) in the CCM Program and working to find nurse availability. The full list of potential reasons as identified by MassHealth is provided in Appendix B. Many of the reasons reflect the complex nature of identifying a nurse to fit the unique needs of a patient requiring CSN services. A nurse not only must be matched to the unique skill set required to treat a patient, and the schedule of the patient's specific needs, but also must be accepted by the patient to provide that care. For example, a nurse might have the training necessary to care for a ventilator-dependent patient, but the personality of the nurse might not be a good fit, and the patient will decline services from the particular provider. If requested by the patient or their family, the CCM Program may work with a patient to match the patient's specific needs with a CSN provider. If the member chooses to decline the nurse identified by the CCM Program, the CCM Program will continue to work with the patient to find another

[xxiii] The difference between authorized and utilized hours might be due to a number of reasons, including a modification, within the authorization period, of the total number of authorization hours. The MassHealth data system only captures the final modified hours. See Appendix B for staffing-related reasons.

nurse who will be a better match if the member and family chooses to have the CCM Program's continued involvement.

In a 2017 survey administered by the University of Massachusetts Medical School, independent nurses rated several attributes higher than rate of pay, although rate of pay was rated as the most influential factor when deciding whether to continue in their positions as independent nurses (see Appendix C).

2.3.3.2 HHA Unfilled Authorized Hours Factors

One HHA (of the 6 out of 20 HHAs that responded to BerryDunn's survey) reported it has adequate staffing, and the other 5 responding HHAs indicated they could not fill authorized hours for the patients they are currently serving. The primary reason provided by latter agencies is that they do not have enough staff. The percentage of hours that HHAs were unable to fill ranged from 11% to 30%. Although many HHAs commented that they are able to perform the initial evaluation, the additional authorized hours that remain unfilled were based on the following staffing limitations:

- Many nurses only work per diem; scheduling around their other jobs
- Inadequate financial compensation
- Difficulty recruiting/retaining despite ongoing efforts; not staffed to full capacity
- Nurses canceling shifts for sickness or other reasons when no replacement is available

In a 2017 survey administered by the University of Massachusetts Medical School on behalf of MassHealth, HHAs responded about the challenges of filling authorized hours, with finding a bilingual/multilingual nurse rated the most difficult, and other factors associated with finding a fit with the patients' overall needs at the top of the concerns (see Appendix D).

2.3.4 Number of Independent Nurses Caring for More Than One Patient

This section includes data on the number of nurses taking care of more than one patient at a time, and for the patients cared for by those nurses, the aggregate proportion of authorized CSN hours to utilized CSN hours.

CSN services may be provided to multiple patients at a time. As set forth in 101 CMR 361.04, the multiple-patient nursing reimbursement rate is based on providing CSN services to either two or three individuals.

BerryDunn obtained data from MassHealth on the number of nurses who independently contract to deliver CSN care. Exhibit 8 below presents the number of nurses providing these services to more than one patient.

Exhibit 8: Number of Independent Nurses Providing CSN Care to More Than One Patient Aggregate Proportion of Utilized Hours to Authorized Hours[15]

TIME PERIOD	NUMBER OF INDEPENDENT NURSES	TOTAL AUTHORIZED HOURS	TOTAL UTILIZED HOURS	RATIO OF UTILIZED HOURS TO AUTHORIZED HOURS
Prior Period*	8	14,227	13,289	93%
Current Period**	15	27,866	22,136	79%

*Prior Period: July 1, 2016 – June 30, 2017
**Current Period: July 1, 2017 – June 30, 2018

MassHealth does not have comparable data in its reporting systems for nurses employed by HHAs providing CSN services. Consequently, BerryDunn surveyed all 20 HHAs that contract with MassHealth to provide CSN care. Six HHAs responded; MassHealth calculated that during the measurement periods, these 6 HHAs provided 56% of the CSN services provided by the 20 HHAs that contract to provide CSN services to MassHealth members. BerryDunn asked the HHAs how many of their nurses provided CSN services to more than one patient.[xxiv] Three of the HHAs responded that their nurses do not provide CSN services to more than one patient, and the remaining three of the six HHAs responded that nurses do provide such care.

For HHAs in the latter group, the total number of nurses providing care to more than one patient compared to the total number of employed nurses is as follows: 1) 3 out of 181 (approximately 2%); 2) 12 out of 430 (approximately 3%); and 32 out of 279 (approximately 11%). In aggregate, including the HHAs that do not provide care to more than one patient, approximately 4% of employed nurses provide care to more than one patient at a time. This percentage is consistent with the proportion of independent nurses contracting directly with MassHealth who care for more than one patient at a time. Based on the information provided by MassHealth and the HHA survey responses, the majority of patients receive CSN services individually with a 1:1 nurse-to-patient ratio. To the extent that available information allows such comparisons, the ratio of utilized-to-authorized services is higher among those treating multiple patients than in the overall population of persons receiving CSN care.

2.3.5 Nurses Providing CSN Care Through Direct Contracts and HHA

In this section, BerryDunn reports the number of nurses who contract with MassHealth to provide CSN care, the number of nurses who provide CSN care through a HHA that contracts with MassHealth, and whether the total number of nurses providing such care is sufficient to fill all authorized CSN hours.

MassHealth provided the number of independent nurses currently billing for CSN services to adult and pediatric members, and BerryDunn surveyed the 20 HHAs currently contracted with MassHealth to provide CSN care. As

[xxiv] HHAs were asked to include only CSN services (not intermittent services).

noted above, of the 20 HHAs surveyed, BerryDunn received responses to its survey from 6 agencies, representing 56% of HHA CSN charges.[xxv]

During the applicable periods, there were 414 independent nurses (300 RNs and 114 LPNs)[xxvi] in the Commonwealth providing and billing for CSN services. Twenty HHAs within MassHealth's HHA provider network provide CSN services. Nurse staffing levels at the HHAs vary; some report as many as 430 (268 RNs and 162 LPNs) nurses to as few as 31 (20 RNs and 11 LPNs) nurses providing CSN services. The total number of RNs and LPNs in the six responding agencies is 1103 (707 RNs and 396 LPNs). Since BerryDunn did not receive responses from all 20 HHAs, the total number of nurses employed by HHAs is unknown, but an approximation can be provided. The 6 HHAs that responded to the survey provide 56% of all CSN services[xxvii] among the 20 HHAs surveyed.[16] Assuming the ratio of nurses to patients in the six agencies is representative of the total number of nurses working in HHAs, the total number of nurses would be approximately 1,970. As the nurse/patient ratio in the agencies that did not respond to the survey is unknown, the actual number could vary significantly from this limited estimate.

2.3.6 Nurse Educational and Experience Requirements

Section 24 requires a description of the training, experience, and education levels of the nurses who provide CSN care. The nurses who provide CSN care are either independent nurses who contract directly with MassHealth or who are employed by an HHA. Children and adults receiving CSN care have complex chronic conditions and often require medical equipment (e.g., ventilators), technology (e.g., various monitors), and therapy services, in addition to general nursing care.

Nurses working directly for MassHealth through an independent contract must comply with the regulations including, but not limited to, 130 CMR 414.000 and 450.000.[xxviii] In order to participate as a MassHealth independent nurse provider, a nurse must:

- Be licensed and in good standing as a nurse by the board of registration for the state in which the nursing services are provided
- Meet all provider eligibility requirements set forth in 130 CMR 450.212[xxix]
- Sign a MassHealth provider contract and receive a MassHealth provider number
- Notify MassHealth in writing within 14 days of any change in any information submitted in the provider application in accordance with 130 CMR 450.232(B)[xxx]

[xxv] Calculated as the percentage of total cost of CSN services.

[xxvi] MassHealth provided a list of 521 independent nurses who have been active in their system since 2008. This study only includes those nurses with billing activity in 2016, 2017, 2018, and 2019 to cover the study time periods.

[xxvii] Calculated as the percentage of total cost of CSN services.

[xxviii] 130 CMR 414.000 states the requirements for the payment of nursing services, and 130 CMR 450.000 sets forth the Administrative and Billing regulations for the Division of Medical Assistance.

[xxix] 130 CMR 450.212 sets for the Provider Eligibility Criteria to be eligible to participate in MassHealth as any provider type.

[xxx] 130 CMR 450.232(B) states that each MassHealth provider must notify the MassHealth agency in writing within 14 days of any change in any of the information submitted in the application. Failure to do so constitutes a breach of the provider contract. In no event may a group practice file a claim for services

Pursuant to 101 CMR 361.02, reimbursable CSN services may be provided by an RN or LPN who directly provides authorized CSN services and who bills independently for services rendered. To be licensed as an RN or LPN in Massachusetts, the Board of Registration in Nursing requires licensure applicants to provide proof that they: 1) graduated from a board-approved nursing program; 2) are of good moral character, as defined by state law; and 3) have passed the National Council Licensure Examination (NCLEX).[17]

Beyond the statutory requirements set forth above and any specific state licensure requirements (e.g., Massachusetts Board of Nursing Standards for an RN or LPN), there are no other training, education, or experience requirements for nurses who contract with MassHealth as independent nurses providing CSN care.

HHAs may provide CSN services as long as they meet the requirements set forth in 130 CMR 403.000 and 450.00.[xxxi] Nurses employed by HHAs to provide CSN services must also be licensed as a RN or LPN, and thus must comply with the Board of Registration in Nursing requirements for licensure as discussed above. MassHealth also requires HHAs to be Medicare certified, and thus HHAs must comply with CMS' Conditions of Participation (CoPs) for HHAs.

BerryDunn surveyed HHAs to determine their training and experience requirements as well as the education level of nurses that they employ to provide CSN. For the six HHAs that responded, employment requirements for nurses providing CSN care mirrored those of MassHealth. HHAs reported that they require their nurses to be RNs and LPNs with varying experience and training requirements. Upon employment, some HHAs train nurses to address specific patient needs and complexity. Some HHAs also reported that they require six months to one year of recent nursing experience before being considered for employment.

2.3.7 Reimbursement Rates

This section of the report presents findings on reimbursement rates for independent nurses delivering CSN care as established in 101 CMR 361.04(2).[xxxii] As required by Section 24, BerryDunn compared these rates to those paid wages to nurses providing CSN care through an HHA that contracts with MassHealth, as well as with the median wage rate paid to all nurses in Massachusetts. The purpose of this evaluation is twofold: 1) to determine the adequacy of reimbursement rates offered by MassHealth to contracted nurses, and 2) to understand how differences in rates across these three groups may impact the supply of nurses for CSN care reimbursed by MassHealth.

Before discussing the comparisons required by Section 24, it is important to provide a few limitations that make such comparisons difficult. These can be summarized as:

provided by an individual practitioner until the individual practitioner is enrolled and approved by the MassHealth agency as a member of the group. At its discretion, the MassHealth agency may require a provider to recertify, at reasonable intervals, the continued accuracy and completeness of the information contained in the provider's application. Failure to complete such recertification upon request by the MassHealth agency may result in termination of the provider contract.

[xxxi] 130 CMR 403.405 and 403.406 state the HHA provider eligibility requirements in state and out of state. An HHA providing CSN care in Massachusetts must be a certified provider of home health services under the Medicare program by the Massachusetts Department of Public Health.

[xxxii] 101 CMR 350.04 establishes rates for payment for home health services in the home. 101 CMR 361.04 sets forth the rates of payment for CSN Services in the Home. For the purposes of this report, the rate comparisons are to those set forth in 101 CMR 361.04.

- Provider rates paid to independent nurses by MassHealth are not directly comparable to wages received by nurses employed by HHAs or any other organization in Massachusetts as they do not treat fringe benefits and other applicable overhead costs similarly
- Wage rates paid by HHAs to nurses providing CSN care are not publicly available in a comprehensive resource
- BLS data include a one-year time lag and lack wage information on independent nurses, the levels of clinical experience, the relative level of specific skill required, the type of clinical setting or specialty

In the descriptions of the wage data comparisons presented below, BerryDunn elaborates these issues and how they were addressed in the analysis.

Reimbursement rates paid to RNs and LPNs who contract directly with MassHealth are publicly available from the Massachusetts' Executive Office of Health and Human Services, per Section 361.04.[xxxiii] BerryDunn converted these rates from rates per 15-minute period to hourly rates. Hourly reimbursement rates for independent nurses set to true economic costs would be higher than salaried wages because the former would generally account for benefits (e.g., employer-provided health insurance and retirement contributions) that are provided to employees of healthcare provider organizations, as well as allowing for the greater cost burdens associated with being an independent nurse (or provider agency), including the employer portion of payroll taxes. Put another way, an independent nurse has similarities to a small agency in having overhead costs related to benefits, employment taxes, etc. As with HHAs, the independent nurse must pay these overhead expenses in addition to "wages"—in their case, the amount left over after overhead is paid.

To make the contracted reimbursement rates for independent nurses more comparable to the wages paid to nurses by HHAs and other provider organizations, an adjustment for these additional contractor expenses can be applied to the reimbursement rates. One estimate of the factor by which one should adjust independent nurse rates to allow for these additional costs relative to an employment wage is 0.77.[18] That is, applying a factor of 0.77 to an independent nurse reimbursement rate provides an estimate of a comparable employee wage rate before benefits.

Salaries/wage rates for RNs and LPNs employed by HHAs who contract with MassHealth are not publicly available as a comprehensive resource; therefore, BerryDunn obtained data through surveys and follow-up phone calls to those agencies. Six of the 20 HHAs in Massachusetts that provide CSN responded with hourly wage data, thereby limiting the representativeness of BerryDunn's findings, though the survey data set represents wage levels for providers delivering approximately 56% of CSN services paid for by MassHealth. All six HHAs that provided hourly wage data did so in the form of a range. As a result of these limitations from the data provided by those agencies that responded, BerryDunn produced the range of surveyed values rather than an average or median. Wage rates in the survey fielded for this study for HHA nurse employees do not account for standard benefits offered to them, such as health insurance or retirement contributions.

[xxxiii] https://www.mass.gov/files/documents/2019/07/15/jud-lib-101cmr361.pdf

Finally, BerryDunn procured 2017 and 2018 data on average hourly wage rates paid to all RNs and LPNs in Massachusetts through the United States Bureau of Labor Statistics (BLS) and the Massachusetts Department of Unemployment Assistance, respectively.[xxxiv,xxxv] The latter source applied BLS methodology but is not an official estimate. Estimates are calculated using wage data from Massachusetts employers and thus do not include independent nurses. Wage rates also do not include benefits and do not account for factors such as overtime pay or bonus rates for working with multiple patients simultaneously. For 2018 data, wages were also stratified by occupation title; BerryDunn's analysis focused only on those in the "Health Care and Social Assistance" category, and within that category, RNs and LPNs.

In summary, the three points of comparison required by Section 24 are presented and analyzed: 1) independent nurse reimbursement rates, 2) the wage information in the HHA survey data, and 3) the BLS wage data for all Massachusetts RNs and LPNs. In order to make the independent nurse reimbursement data comparable to the two sources of wage data, BerryDunn also presents those rates adjusted for the costs of self-employment by applying a factor of 0.77 to the reimbursement rates as described above.

Exhibit 9 presents these sources of estimated hourly wage rates for RNs and LPNs. Wages are broken out separately by the number of patients treated at the same time (in most cases one patient only) as well as the shift during which services are provided. Wage data was limited for RNs and LPNs who provide care for more than one patient at a time, because this is a relatively rare circumstance.

[xxxiv] https://www.bls.gov/oes/current/oes292061.htm#st

[xxxv] https://www.bls.gov/oes/2017/may/oes291141.htm#st

Exhibit 9: Hourly Wage Rates for RNs and LPNs, by Number of Patients, Shift, and Payer Source

SINGLE PATIENT

CODE	MODIFIER	UNADJUSTED HOURLY RATES FOR NURSES CONTRACTING DIRECTLY WITH MASSHEALTH (AVG, 2019)	ADJUSTED HOURLY RATES FOR NURSES CONTRACTING DIRECTLY WITH MASSHEALTH (AVG, 2019)	HOURLY RATES FOR NURSES EMPLOYED BY SIX HHAS (RANGE, 2019)	HOURLY RATES FOR ALL NURSES IN MASSACHUSETTS (MEDIAN, 2018)[xxxvi]	DESCRIPTION
T1002		$43.72	$33.66	$27.00 – $36.00	$41.88 ($31.07 – $51.50)	RN Services, Weekday
T1002	UJ	$46.76	$36.01	$30.00 – $37.16		RN Services, Nights
T1002		$62.60	$48.20	$40.37 – $55.74		RN Services, Holidays
T1003		$36.40	$28.03	$21.63 – $30.00	$27.62 ($22.72 – $31.44)	LPN Services, Weekday
T1003	UJ	$39.00	$30.03	$22.43 – $31.00		LPN Services, Nights
T1003		$52.44	$40.38	$30.42 – $46.80		LPN Services, Holidays

MULTIPLE PATIENTS

CODE	MODIFIER	UNADJUSTED HOURLY RATES FOR NURSES CONTRACTING DIRECTLY WITH MASSHEALTH (AVG, 2019)	HOURLY RATES FOR NURSES CONTRACTING DIRECTLY WITH MASSHEALTH (AVG, 2019)	HOURLY RATES F OR NURSES EMPLOYED BY SIX HHAS (RANGE, 2019)	HOURLY RATES FOR ALL NURSES IN MASSACHUSETTS (MEDIAN, 2017)	DESCRIPTION
T1002	TT	$63.16	$48.63	$42.00 – $48.50	-	RN Services, Weekday
T1002	U1	$67.76	$52.17	$44.50 – $50.16	-	RN Services, Nights
T1002	TT	$91.52	$70.47	$63.00 – $75.24	-	RN Services, Holidays
T1003	TT	$52.84	$40.69	$35.00 – $41.75	-	LPN Services, Weekday
T1003	U1	$56.68	$46.64	$37.75 – $44.20	-	LPN Services, Nights
T1003	TT	$76.84	$59.16	$52.50 – $66.30	-	LPN Services, Holidays

THREE PUBLICLY AIDED INDIVIDUALS

[xxxvi] 2018 data is from the Massachusetts Department of Unemployment Assistance

CODE	MODIFIER	UNADJUSTED HOURLY RATES FOR NURSES CONTRACTING DIRECTLY WITH MASSHEALTH (AVG, 2019)	HOURLY RATES FOR NURSES CONTRACTING DIRECTLY WITH MASSHEALTH (AVG, 2019)	HOURLY RATES FOR NURSES EMPLOYED BY SIX HHAS (RANGE, 2019)	HOURLY RATES FOR ALL NURSES IN MASSACHUSETTS (MEDIAN, 2017)	DESCRIPTION
T1002	U2	$73.28	$56.43	$55.75 – 59.75	-	RN Services, Weekday
T1002	U3	$78.60	$60.52	$55.75 – 59.75	-	RN Services, Nights
T1002	U2	$106.36	$81.90	-	-	RN Services, Holidays
T1003	U2	$61.28	$47.19	$48.75 – 52.75	-	LPN Services, Weekday
T1003	U3	$65.80	$50.66	$48.75 – 52.75	-	LPN Services, Nights
T1003	U2	$89.28	$52.94	-	-	LPN Services, Holidays

OVERTIME

CODE	MODIFIER	UNADJUSTED HOURLY RATES FOR NURSES CONTRACTING DIRECTLY WITH MASSHEALTH (AVG, 2019)	HOURLY RATES FOR NURSES CONTRACTING DIRECTLY WITH MASSHEALTH (AVG, 2019)	HOURLY RATES FOR NURSES EMPLOYED BY SIX HHAS (RANGE, 2019)	HOURLY RATES FOR ALL NURSES IN MASSACHUSETTS (MEDIAN, 2017)	DESCRIPTION
T1002	TU	$62.60	$48.20	$40.50 – $54.00		RN Services, Weekday
T1002	U4	$67.20	$51.74	$40.50 – $55.74	-	RN Services, Nights
T1002	TU	$90.96	$70.04	$40.50 – $60.55		RN Services, Holidays
T1003	TU	$52.44	$40.38	$32.50 – $45.00		LPN Services, Weekday
T1003	U4	$56.28	$43.34	$33.64 – $46.80	-	LPN Services, Nights
T1003	TU	$76.36	$58.80	$34.50 – $52.44		LPN Services, Holidays

Average hourly rates for RNs and LPNs who contract with MassHealth to provide CSN care, once adjusted for independent contractor costs to create an appropriate comparison, generally fall within the midrange to top of the range of average hourly wages for their counterparts who are employed by HHAs to deliver CSN care. There are nonetheless exceptions where rates for independent nurses are above the range, such as RN and LPN overtime rates for holidays or those who work nights to provide care to multiple patients.

Median hourly wages in 2018 for RNs across the Commonwealth of Massachusetts who are employed by an organization (regardless of the type of care they provide) were $41.88, ranging from $31.07 for entry-level positions to $51.50 for experienced ones. Other than entry-level nurses, this range is higher than the estimated adjusted equivalent wage rate of $33.66 per hour to RNs (one patient, weekdays) in 2019 who contract independently with MassHealth to deliver CSN care.

For LPNs, median hourly wages in 2018 in all settings across the Commonwealth of Massachusetts who are employed by an organization (regardless of the type of care they provide) were $27.62, ranging from $22.72 for entry-level positions to $31.44 for experienced ones. This is in the general range of the approximately $28.03 per hour adjusted value estimated from the contracted rate paid to independent LPNs (one patient, weekdays).

Overall, the data suggest that payment levels for RNs providing CSN care (either independently or as employees of HHAs) might be lower than the statewide averages for RNs, while rates for LPNs are more consistent with statewide LPN pay.

The statewide BLS nurse wage data from all settings have a one-year lag relative to the MassHealth payment rate data; therefore, the degree to which RN wages for CSN care are below generally prevailing RN pay will be understated if overall RN pay has increased on average over that year. The comparison required by Section 24 of reimbursement for CSN care to generally prevailing nursing wage rates (based herein on the BLS data) does not allow for consideration of several factors that might influence the wage rates, including the relative levels of clinical experience, the relative level of specific skill required, differences in the desirability of the work, or the type of clinical setting or specialty. Absent data on these unknown differences, it is difficult to draw a balanced conclusion about wages across both groups.

Lack of sufficient responses to BerryDunn's survey prevented calculation of the percent of RNs in Massachusetts who are employed by an organization relative to those who work as independent nurses, and lack of available data generally prevented determining the extent to which wages vary by the type of work conducted by an RN.

3.0 Conclusion

CSN care is critical for children and adults with complex medical needs, as some of these individuals may require equivalent care provided in an institutionalized setting without these community-based services. Although a nurse may provide CSN care to more than one patient at a time, the majority of patients receive care on a one-to-one nurse-to-patient basis. Through analysis, BerryDunn identified that 4% of all pediatric and adult patients receiving CSN care are being treated by an RN or LPN simultaneously with at least one other patient.

Given the nature of BerryDunn's study, the firm is limited in the conclusions it can draw about patterns or factors driving the supply and demand of CSN care in Massachusetts. Data from this study nevertheless suggest a gap exists, in that approximately 68% to 72% of authorized CSN hours were filled by nurses during the prior period and current period. While several factors likely impact the level of utilization of CSN care relative to authorized hours, nurse availability was cited as the primary reason by HHAs responding to the survey fielded for this study. Data limitations notwithstanding, BerryDunn's analysis indicates that average wages for all RNs in Massachusetts could be higher than for nurses who provide CSN care. Relatively low wages or payment rates might play a role in employment decisions made by qualified nurses. Wages for LPNs providing CSN care may be more similar to wages for LPNs in other settings.

Increasing the proportion of authorized hours of CSN care that are utilized is a significant issue in the Commonwealth, with approximately 30% of the hours not being utilized by medically complex adult and pediatric patients. Increased compensation for nurses providing CSN services might mitigate some of the gap between authorized and utilized hours, but would likely not address the problem completely, in that nurses' employment decisions are based on many factors; and, because of the challenge to match the specific and complex needs of each patient and family to available nurses providing CSN care.

Appendix A

Acts of 2019 Chapter 41: An Act making appropriations for the fiscal year 2020 for the maintenance of the departments, boards, commissions, institutions and certain activities of the Commonwealth, for interest, sinking fund and serial bond requirements and for certain permanent improvements.

Section 11. Chapter 12C of the General Laws is hereby amended by inserting after section 23 the following section:

Section 24. The center, in conjunction with MassHealth, shall prepare a biennial report on the provision of continuous skilled nursing care as defined in 101 CMR 361 and 130 CMR 403.402. The report shall include, but not be limited to: (i) the number of pediatric patients and the number of adult patients requiring continuous skilled nursing care; (ii) the average and median number of continuous skilled nursing hours authorized by MassHealth per day, week, month and year for pediatric patients and for adult patients; (iii) the average and median number of authorized continuous skilled nursing hours actually delivered per day, week, month and year for pediatric patients and for adult patients; (iv) the total number of continuous skilled nursing hours authorized and actually delivered by MassHealth per month and year for pediatric patients and for adult patients; (v) the number of nurses providing continuous skilled nursing care to more than 1 patient at a time and, for the patients cared for by those nurses, the aggregate proportion of authorized continuous skilled nursing hours to utilized continuous skilled nursing hours; (vi) the number of nurses who contract with MassHealth to provide continuous skilled nursing care, the number of nurses who provide continuous skilled nursing care through a home health agency that contracts with MassHealth and whether the total number of nurses providing such care is sufficient to fill all authorized continuous skilled nursing hours; (vii) a description of the training, experience and education levels of the nurses who contract with MassHealth to provide continuous skilled nursing care; and (viii) an evaluation of the adequacy of the reimbursement rates for continuous skilled nursing care as established in 101 CMR 350.04[xxxvii] and a comparison of those rates against: (A) the rate paid to nurses who contract directly with MassHealth to provide continuous skilled nursing care; (B) the portion of the reimbursement rate paid directly as wages to nurses providing continuous skilled nursing care through a home health agency that contracts with MassHealth; and (C) the median wage rate paid to all nurses in the commonwealth.

Not later than January 1 of each even-numbered year, the report shall be filed with the secretary of health and human services, the clerks of the senate and the house of representatives, the joint committee on health care financing, the joint committee on public health and the senate and house committees on ways and means. The center shall make the report publicly available on its website.

[xxxvii] 101 CMR 350.04 establishes rates for payment for home health services in the home. 101 CMR 361.04 sets forth the rates of payment for CSN Services in the home. For the purposes of this report, the rate comparisons are to those set forth in 101 CMR 361.04.

Appendix B

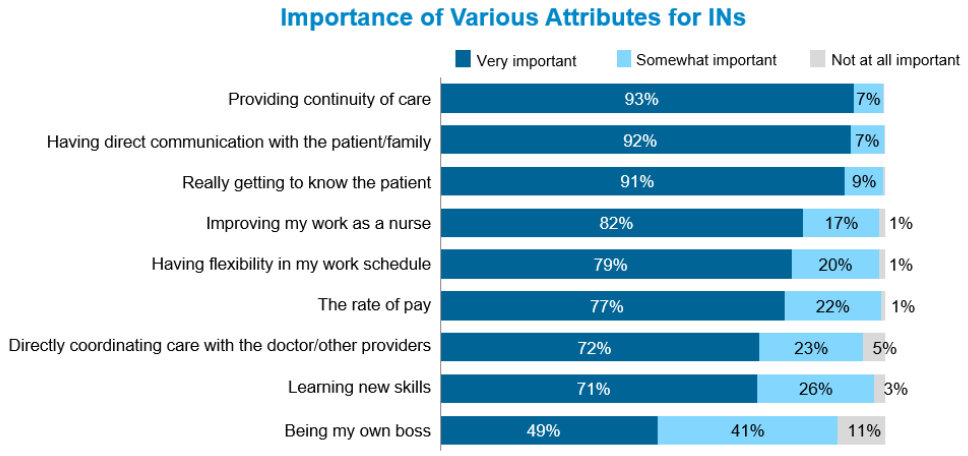
List of reasons CSN authorized hours might not be utilized[xxxviii]

- The member might not find a nurse in his/her area with availability that matches his/her needs
- The member might have declined offers by HHAs or independent nurses to cover portions of their authorized hours. Member reasons for refusal of a particular nurse might include:
  - The member does not believe the nurse is the right fit
  - The member does not feel the nurse has the skills and/or training to safely care for his/her needs
  - The member dislikes a non-nursing related attribute of the nurse (e.g., smoker, gender, etc.)
- The member chooses not to fill his/her CSN hours because:
  - He/She prefers the personal care attendant (PCA) option in which the family uses PCA services in lieu of CSN
  - He/She prefers to "bank" authorized hours for later use
- The member does not want to set scheduled shifts, but would rather nurses to be flexible with their availability
- The member is waiting for a specific nurse to be available through an HHA or to obtain provider number
- The member travels and does not take nursing with him/her
- A member's hours are filled, but the nurse gets sick, goes on vacation, etc., and there is no coverage from the agency and/or other co-vending providers
- A member's hours are filled, but his/her nurse ends up leaving the agency, or ending his/her contract with MassHealth to pursue other personal or career opportunities
- The member is new (under three months) in the CCM Program and is working to find nursing availability
- The member is hospitalized during a period for which he/she would typically receive CSN services
- The member's condition changes, and he/she no longer needs services authorized (or some portion of)
- The member's living arrangements change so that CSN services are no longer necessary, i.e., he/she moves out of state, moves to a setting that offers nursing, etc.
- HHA discharges member due to safety concerns for HHA staff and/or difficult member/family behaviors impacting care
- The member passes away before the end of the PA period

[xxxviii] This list was provided by MassHealth, and it underscores many of the reasons that filling authorized is challenging. It is not provided in order of frequency, and it is not intended to be an exhaustive list.

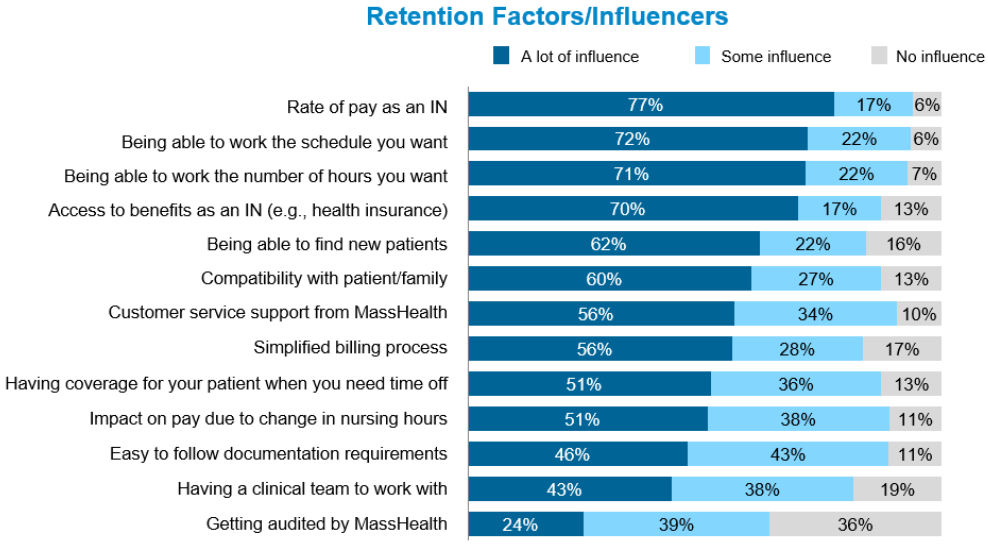
Appendix C

MassHealth Independent Nurse Survey Administered in 2017 by University of Massachusetts Medical School



Q12 Thinking of your work as an Independent Nurse (IN), how important to you are each of the following? (Base: Total=244)
Variable base size changes per item

UMass Medical School | Independent Nursing Pilot Program | Survey Results | June 2017

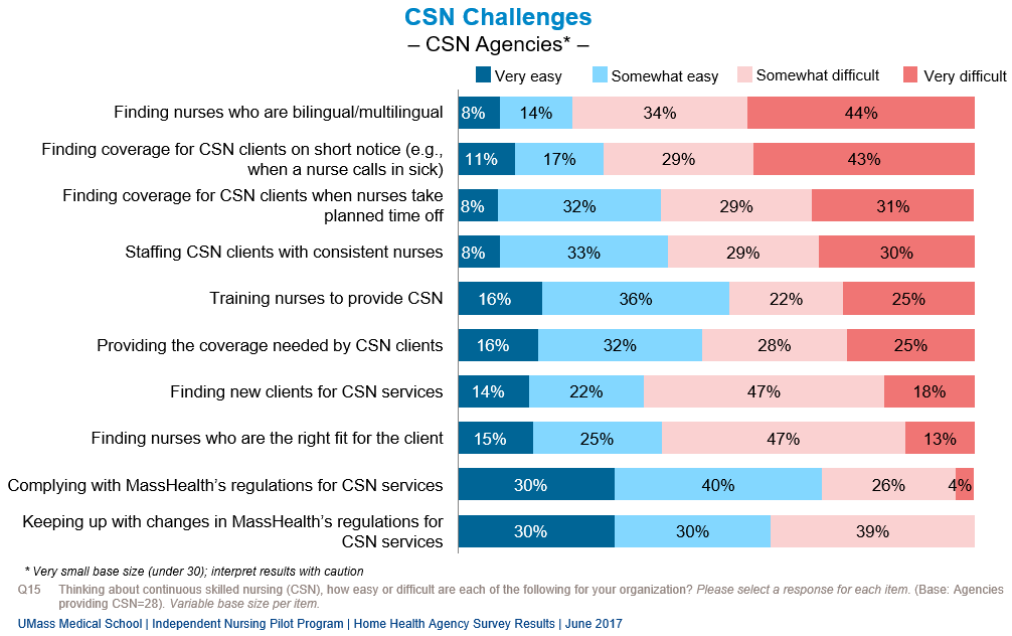


Q19 How much of an influence would each of the following have on your decision to continue working as an Independent Nurse (IN)? (Base: Total=244)
Variable base size changes per item

UMass Medical School | Independent Nursing Pilot Program | Survey Results | June 2017

Appendix D

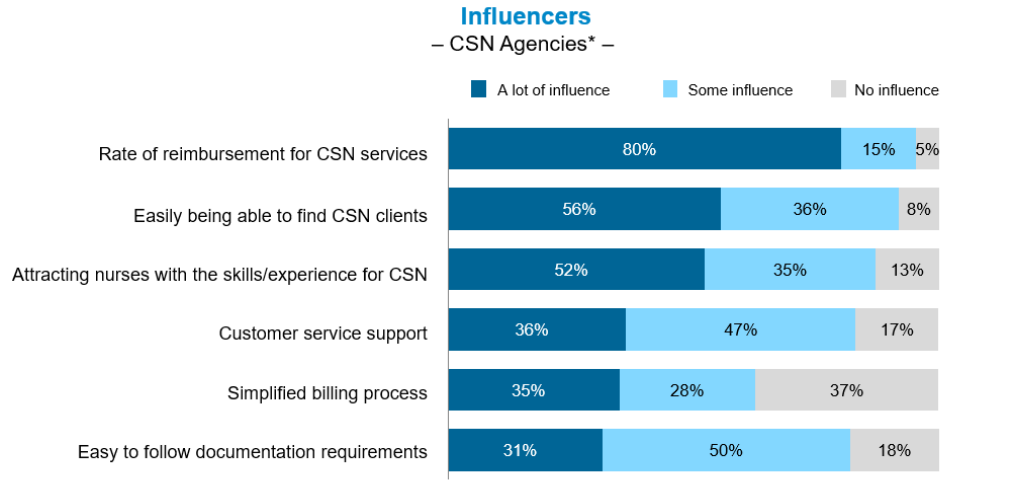
MassHealth Independent Nurse Survey Administered in 2017 by University of Massachusetts Medical School



** Very small base size (under 30); interpret results with caution*

Q15 Thinking about continuous skilled nursing (CSN), how easy or difficult are each of the following for your organization? *Please select a response for each item.* (Base: Agencies providing CSN=28). *Variable base size per item.*

UMass Medical School | Independent Nursing Pilot Program | Home Health Agency Survey Results | June 2017



** Very small base size (under 30); interpret results with caution*

Q30 How much of an influence would each of the following have on your organization's decision to continue providing CSN services? *Please select a response for each item.* (Base: Agencies providing CSN=28)

Variable base size per item

UMass Medical School | Independent Nursing Pilot Program | Home Health Agency Survey Results | June 2017

Endnotes

[1] 101 CMR 361 defines Continuous Skilled Nursing Care as "a nurse visit of more than two continuous hours of nursing services."

[2] 101 CMR 361.4. Accessed 5 December 2019: **https://www.mass.gov/doc/rates-for-continuous-skilled-nursing-services-effective-july-12-2019-0/download.**

[3] Email from MassHealth to BerryDunn dated December 5, 2019.

[4] BerryDunn interview with a CCM Program representative, December 11, 2019.

[5] Cohen E, Berry JG, Camacho X, Anderson G, Wodchis W, Guttmann A. Patterns and costs of health care use of children with medical complexity. Pediatrics. 2012 Dec;130(6):e1463–70. Accessed: Accessed 13 December 2019. Accessed 5 December 2019: **https://www.ncbi.nlm.nih.gov/pubmed/23184117**.

[6] Coller R, Nelson B, Sklansky D, et.al. Preventing Hospitalizations in Children with Medical Complexity: A Systematic Review. Pediatrics. November 2014. Accessed 13 December 2019: **http://pediatrics.aappublications.org/content/early/2014/11/05/peds.2014-1956**.

[7] Cohen E, Kuo D, Agrawal R, et.al. Children With Medical Complexity: An Emerging Population for Clinical and Research Initiatives. Pediatrics. Mar 2011;127(3):529-538. Accessed 13 December 2019: **http://pediatrics.aappublications.org/content/127/3/529.short**.

[8] Community Case Management. Commonwealth Medicine. January 28, 2018. Accessed 5 December 2019: **https://commed.umassmed.edu/our-work/2018/01/28/community-case-management**.

[9] Provided by MassHealth.

[10] Provided by MassHealth.

[11] Based on calendar year 2017 data. Data provided by MassHealth in an email dated November 27, 2019.

[12] Provided by MassHealth.

[13] Provided by MassHealth.

[14] Provided by MassHealth.

[15] Provided by MassHealth.

[16] Percentage provided by a MassHealth representative.

[17] Massachusetts Board of Registration in Nursing. Accessed 8 December 2019: **https://www.mass.gov/how-to/apply-for-a-nursing-license-by-exam**.

[18] The 1.3 inflation factor from wages to service fees translates to a 0.77 factor to deflate fees to effective hourly wage/salary values. Accessed 1 January 2020: **https://www.salary.com/articles/pay-yourself-right-when-being-your-own-boss/**.