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Background: The delivery of emergency, trauma, critical, and intensive care services requires coordination among all members of the care team. Perceived teamwork and role clarity may vary among physicians (MDs) and nurse practitioners (NPs).

Purpose: To examine differences in perceived roles and responsibilities of NPs and MDs practicing in emergency, trauma, critical, and intensive care.

Methods: Secondary Analysis of the National Survey of Emergency, Intensive, and Critical Care Nurse Practitioners and Physicians, a cross-sectional national survey of clinicians. Mail survey of randomly selected stratified cross-sectional samples of MDs and NPs drawn from national lists of clinicians in eligible specialties working in emergency, trauma, intensive, and critical care units in the United States. 814 clinicians (351 NPs and 463 MDs) were recruited from national by postal mail survey. Our initial sample included \( n = 2,063 \) clinicians, \( n = 1,031 \) NPs and \( n = 1,032 \) MDs in eligible specialties. Of these, 63.5% of NPs and 70.1% of MDs completed and returned the survey excluding those who were ineligible due to lack of current practice in a relevant specialty.

Findings: NPs in ICU/CCU are more likely to be female and report working fewer hours than do MDs and provide direct care to more patients. 55% of NPs and 82% of MDs agree that their individual role in their unit is clear (\( p < .001 \)); 34% of MDs and 42% of NPs agree that their unit is an example of excellent teamwork among professionals (\( p = 0.021 \)); 41% of MD and 37% of NP clinicians (\( p = 0.061 \)) agree that their teams are "prepared to provide outstanding care in a crisis or disaster." Perceived role clarity was significantly associated with increased perceptions of excellent teamwork and disaster preparedness.

Discussion: At the time of this survey, and majority of NPs and MDs working in emergency, critical and intensive care did not agree that their teams were prepared for a crisis or disaster. Leaders of health organizations should encourage teamwork and professional role clarity to assist units to perform effectively in emergency and disaster preparedness.

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Introduction

At present, the United States’ (US) healthcare system is facing the challenge of a global pandemic which is impacting intensive and critical care capacity around the world and in major municipal areas in the United States. The delivery of emergency, critical and intensive care services requires time-sensitive and life-dependent coordination and teamwork among all members of the care team (Leggat, 2007). Successful teamwork has long been described as a key component of delivering quality health care (Institute of Medicine, 2001), and has been cited as a significant factor in limiting loss of life in the aftermath of mass casualty events and major outbreaks, including the present COVID 19 pandemic, but also the ongoing challenges of the opioid epidemic (Biddinger et al., 2013; Gawande, 2013; Stempniak, 2016). Coordinated critical care in teams, such as the ICU Liberation Project, have significantly reduced mortality and long term cognitive impairment while reducing the costs of care (Ely, 2017).

Teams can be complex in these care settings, and measuring the configuration and work of teams may require a deeper explication of roles and scope of practice to determine efficient and effective staffing and work design (Brennan et al., 2013; Valentine et al., 2014). Coordination may be particularly challenging in hospital settings as professionals and staff have become increasingly specialized and roles have expanded. In theory and practice, teams are not simply groups of people who work together, but who interact to reach a common goal, and have roles or functions to perform. Salas and colleagues, in defining ways of measuring individual versus team performance, point to communication, information exchange, leadership and mission or outcome effectiveness as key measures, along with individual cognition, skills and accuracy (Hughes et al., 2016; Wahr et al., 2013).

In 2015, the National Academy of Medicine (formerly the Institute of Medicine) released an update on that report calling for more interprofessional education and practice, and better data on team composition, roles and outcomes (Assessing Progress on the IOM Report The Future of Nursing : Health and Medicine Division, 2020; The Future of Nursing, 2020). A study our team published in 2013 about the roles of NPs and MDs in primary care practices revealed reported similarities with MDs in tasks performed, but revealed deep attitudinal divisions in perceptions of quality, capability, team leadership and payment for services (Donelan et al., 2013; Buerhaus et al., 2014). If these or different conflicts occur in teams in more critical and rapidly evolving situations, quality certainly might suffer.

In this study, we extend our work on the roles of primary care NPs and MDs into the hospital setting and focus on NPs and MDs in emergency, intensive, and critical care teams. We report on NP and MD perceptions in these care settings on their roles and activities, their perceived individual clinical activities, the perceived effectiveness of their teams and their scope of practice. We ask how perceived role clarity and communication predict both team excellence and preparedness to work effectively in a crisis. We hypothesized that MDs and NPs who perceive their roles to be clear would be more likely to perceive excellence in their teamwork, and to report preparedness to function well in a crisis. These data were collected in a period of time when there were several natural and man-made health crises and emergencies in the United States and may provide an interesting lens on our present challenges in coping with the COVID-19 pandemic.

Methods

We conducted the National Survey of Emergency, Intensive, and Critical Care Nurse Practitioners and Physicians with 814 clinicians in the United States (351 NPs and 463 MDs) by postal mail survey. We defined as eligible for the survey clinicians who were licensed NPs or MDs, trained in relevant specialties, and actively working in emergency, trauma, intensive, or critical care hospital units. The study protocol was reviewed and deemed exempt from review by our Institutional Review Board.

Samples

We randomly selected samples of NPs from the Nurse Practitioner Masterfile (a list of 192,680 state licensed NPs in the United States) and MDs from the AMA Masterfile (a comprehensive listing of all licensed physicians in the United States), both purchased through Medical Marketing Service, Inc. (MMS). We selected direct patient care MDs in eligible specialties (Emergency Medicine, Trauma Surgery or Medicine, Critical Care Anesthesia, Pulmonary Critical Care), stratifying the sample to obtain approximately equal representation of Emergency/Trauma and intensive care unit (ICU)/coronary care unit (CCU) providers. We selected NPs in eligible specialties consistent with physician specialties where possible (Emergency, Critical Care, Acute Care). The NP sample file did not contain a variable indicating whether the NP practiced in direct patient care and also was limited in that practice and professional characteristics such as site of practice, years in practice were not available.

Measures

The survey questionnaire was developed by the research team, beginning with our prior survey developed for assessing roles and scope of practice among MDs and NPs practicing in primary care settings and
We tested our hypotheses about role clarity in teams and preparedness for crises using logistic regression analyses. Complete multivariate models are found in the Appendix.

Findings

Description of Sample

Our initial sample included \( n = 2,063 \) clinicians, \( n = 1,031 \) NPs and \( n = 1,032 \) MDs in eligible specialties. Of these, 63.5% of NPs and 70.1% of MDs completed and returned the survey. The 814 completed surveys exclude clinicians who were ineligible due to lack of current practice in a relevant specialty, work setting outside of intensive, critical, emergency, and trauma departments. There were no significant differences in response rate by specialty.

Several differences are observed between the NPs and MDs we surveyed, both in the aggregate and within specialty groups (Table 1). NPs are more likely to be female, white, have master’s degree preparation, and to earn less than MDs. More than 90% of NPs work in collaborative settings with MDs; only 62% of MDs work with NPs in their units. NPs employed in ICU/CCU settings work fewer hours than MDs on average and see more patients; the same is not true in Emergency/Trauma units.

Team Composition, Leadership, and Roles

Clinician reports of the leadership, composition, roles and relationships within their working teams were measured in a series of items (Table 2). MDs report that MDs are their team leaders in most circumstances; NPs are less likely to indicate that MDs lead their teams. We observed some differences in NP and MD perceptions of teams in responses to items about the perception of team roles and role clarity. Less than half of clinicians agree that they experience “excellent” teamwork in their units and that their teams are “prepared to provide outstanding care in a crisis or disaster”. Significantly more MDs than NPs in both unit settings agree that their own personal role in the team is clear, that their colleagues have clear team roles, and that their team displays excellent teamwork. NPs and MDs disagree about the ability of NPs to lead teams and about the quality of the care provided by NPs and MDs when performing similar procedures (4% vs. 62% respectively agree that MDs provide higher quality). 90% of NPs and 55% MDs agree that physicians with whom they work trust NP skills and clinical decisions.

We assessed perceptions of working relationships within teams (all members, NPs and MDs, trainees and attending). While a majority of MDs (77%) and NPs (65%) said all members of their team had excellent or very good working relationships, fewer than half of all

Data Collection

Four waves of mail contact were used. Wave 1 was sent via US priority mail and included: cover letter, questionnaire, $40 incentive check (voided after 2 waves of mailing), and a postage paid return envelope. Waves 2 and 4 were complete packets (absent the incentive) sent by first class mail, and the Wave 3 mailing was also sent priority mail and included a newly issued $60 prepaid incentive check.

Weighting

We used poststratification weights to adjust for nonresponse and stratification. MD respondents were weighted by years in practice, gender and region as there were differences of more than 2% between respondents and nonrespondent MDs; NP respondents by gender and region only as these were the only variables available for target weights.

Analysis: We used the entire sample \( (n = 814) \) for analyses of all attitudinal measures, personal and practice characteristics, and the subgroups of Emergency/Trauma and ICU/CCU who reported working in eligible units or departments. The sampling error (95% confidence interval) for the entire sample is ±3.4%, for all NPs \( (n = 351) \) is 5.2%, for all MDs \( (n = 463) \) is 4.6%. We examine descriptive personal and practice characteristics and multiple attitudinal and experiential outcomes as shown in tables. Question and response wording are shown in the tables, figures, and text.

The primary focus of our analyses was on the comparison of attitudes and experience of MDs and NPs in their respective hospital work settings. We examined the univariate and bivariate relationships, comparing NPs and MDs in the aggregate and by specialty setting (ICU/CCU, emergency/trauma) using two sample t-tests for continuous variables and chi-square tests for categorical variables on measures that were posed to both groups. We also examined differences within each specialty group, and compared groups by age, medicine and nursing teaching hospital, hospital size and state scope of practice. We tested our hypotheses about role clarity in teams...
Table 1 – Characteristics of Respondents

| Respondent characteristics | All | ED/Trauma | ICU/CCU |
|----------------------------|-----|-----------|---------|
|                            | MD  | NP        | p value | MD  | NP        | p value |
| N = 474                   | 363 |           |         | 281 | 166       |         |
| Gender Male               | 383 | 81%       | .001    | 222 | 79%       | .001    |
| Female                    | 84  | 18%       | .281    | 55  | 20%       | .166    |
| White, non-Hispanic       | 338 | 71%       | .0001   | 220 | 78%       | .010    |
| White, non-Hispanic       | 84  | 18%       | .45     | 45  | 16%       | .022    |
| Age <45                   | 177 | 37%       | .03     | 90  | 32%       | .77     |
| Age 45+                   | 284 | 60%       | .06     | 185 | 66%       | .09     |
| Education Masters         | 3   | 1%        | .001    | 3   | 1%        | .001    |
| Doctorate                 | 380 | 80%       | .05     | 219 | 78%       | .0001   |
| Masters                           | 75  | 16%       | .003    | 49  | 17%       | .04     |
| Medical Teaching Hospital   | 293 | 62%       | .001    | 177 | 63%       | .001    |
| Nursing Teaching Hospital   | 335 | 71%       | .001    | 185 | 66%       | .001    |
| Years in practice (mean)   | 17.9| 10.8      | .001    | 19.8| 13.2      | .001    |
| Unit size                  |     |           |         |     |           |         |
| Less than 20               | 119 | 25%       | .43     | 64  | 23%       | .0176   |
| 20–29                      | 125 | 26%       | .32     | 73  | 26%       | .002    |
| 30+                        | 214 | 45%       | .51     | 136 | 48%       | .04     |
| Hospital size              |     |           |         |     |           |         |
| Less than equal to 249     | 162 | 34%       | .04     | 112 | 40%       | .036    |
| 250–499                    | 176 | 37%       | .41     | 100 | 36%       | .091    |
| Collaborative practice      |     |           |         |     |           |         |
| Nurse Practitioners        | 292 | 62%       | .001    | 177 | 63%       | .001    |
| Physicians                 | 377 | 80%       | .001    | 201 | 72%       | .001    |
| Physician Assistants       | 286 | 60%       | .001    | 201 | 72%       | .001    |
| Teaching Affiliations      |     |           |         |     |           |         |
| Medical Teaching Hospital   | 293 | 62%       | .001    | 165 | 59%       | .001    |
| Nursing Teaching Hospital   | 335 | 71%       | .001    | 185 | 66%       | .001    |
| Collaborative practice      |     |           |         |     |           |         |
| Urban                      | 218 | 46%       | .002    | 116 | 41%       | .012    |
| Suburban                   | 187 | 39%       | .001    | 117 | 42%       | .037    |
| Rural                      | 55  | 12%       | .49     | 40  | 14%       | .166   |
| Collaborative practice      |     |           |         |     |           |         |
| Number of actual hours per week (mean) | 48.8| 42.6 | .001 | 42.7 | 40.3 | .0327 |
| Number of patients per day (mean) | 41.8| 52.7 | .001 | 45.7 | 54.0 | .0559 |
Table 2 – Perceptions of Team Roles and Relationships

|                                | ALL MD  | ALL NP  | p value | Emergency/Trauma MD  | Emergency/Trauma NP  | p value | ICU/CCU MD  | ICU/CCU NP  | p value |
|--------------------------------|---------|---------|---------|-----------------------|----------------------|---------|-------------|-------------|---------|
| N                              | 474     | 363     |         | 281                   | 166                  |         | 219         | 214         |         |
| Team leader                    |         |         |         |                       |                      |         |             |             |         |
| Nurse practitioner             | 0       | 0%      | 27      | 7%                    | <.001                |         | 0           | 0%          | 18      | 8%       | <.001 |
| Physician                      | 431     | 91%     | 222     | 61%                   | <.001                |         | 249         | 89%         | 88      | 53%      | <.001 |
| It depends on the patients’ needs and clinical situation | 24      | 5%      | 65      | 18%                   | <.001                |         | 20          | 6%          | 27      | 9%       | <.001 |
| Other (both, not applicable, not sure) | 19      | 4%      | 49      | 14%                   | <.001                |         | 13          | 5%          | 41      | 25%      | <.001 |
| How do you work with on a daily basis? |         |         |         |                       |                      |         |             |             |         |         |
| Registered Nurses              | 457     | 96%     | 349     | 96%                   | 0.8374               |         | 271         | 96%         | 158     | 95%      | 0.5125 |
| Licensed Practical Nurses      | 132     | 28%     | 46      | 13%                   | <.001                |         | 83          | 30%         | 37      | 22%      | 0.095  |
| Primary care nurse practitioner| 128     | 27%     | 90      | 25%                   | 0.4701               |         | 98          | 35%         | 60      | 36%      | 0.7862 |
| Specialized nurse practitioners| 216     | 46%     | 225     | 62%                   | <.001                |         | 111         | 40%         | 70      | 42%      | 0.5789 |
| Physician Assistants           | 286     | 60%     | 207     | 57%                   | 0.3344               |         | 201         | 72%         | 106     | 64%      | 0.0909 |
| Primary Care physicians        | 187     | 39%     | 146     | 40%                   | 0.8218               |         | 98          | 35%         | 71      | 43%      | 0.0962 |
| Specialist physicians          | 370     | 78%     | 305     | 85%                   | 0.0096               |         | 159         | 69%         | 128     | 77%      | 0.0784 |
| Team Assessment (% responding “strongly/ somewhat agree”) |         |         |         |                       |                      |         |             |             |         |         |
| My role is clear to me         | 388     | 82%     | 201     | 55%                   | <.001                |         | 230         | 82%         | 97      | 58%      | <.001 |
| My colleagues have clear roles and responsibilities | 333     | 70%     | 181     | 50%                   | <.001                |         | 196         | 70%         | 82      | 49%      | <.001 |
| My unit or department is an example of excellent teamwork between physicians nurses and other health professionals | 199     | 42%     | 124     | 34%                   | 0.021                |         | 111         | 40%         | 50      | 30%      | 0.046  |
| My colleagues and I are prepared to provide outstanding care in a crisis or disaster | 194     | 41%     | 136     | 37%                   | 0.310                |         | 116         | 41%         | 64      | 39%      | 0.570  |
| When physicians and nurse practitioners perform the same type of procedure or clinical examination physicians provides higher quality care than nurse practitioners | 290     | 61%     | 17      | 5%                    | <.001                |         | 164         | 58%         | 8       | 5%       | <.001 |
| Physicians with whom I work trust nurse practitioner’s skills and clinical decision making | 260     | 55%     | 326     | 90%                   | <.001                |         | 148         | 53%         | 148     | 89%      | <.001 |
| Nurse practitioners are effective leaders of care teams that include physicians nurses and other health professionals | 238     | 50%     | 350     | 96%                   | <.001                |         | 145         | 52%         | 158     | 95%      | <.001 |
| Rating of the quality of working relationships (% responding “excellent/very good”, exclude not applicable) |         |         |         |                       |                      |         |             |             |         |         |
| All members of the clinical team | 363     | 77%     | 235     | 65%                   | 0.0080               |         | 214         | 76%         | 102     | 61%      | 0.004  |
| NPs and attending MDs          | 288     | 61%     | 286     | 79%                   | <.0001               |         | 167         | 59%         | 131     | 79%      | <.0001 |
| NPs and trainee MDs            | 147     | 31%     | 166     | 46%                   | <.0001               |         | 85          | 30%         | 76      | 46%      | 0.001  |
| Attending MDs and nurse trainees | 202     | 43%     | 115     | 32%                   | 0.001                |         | 110         | 39%         | 55      | 33%      | 0.142  |
clinicians surveyed reported positive interprofessional working relationships between staff clinicians and trainees. Only 31% of MDs and 46% of NPs said relationships between NPs and MD trainees were “excellent or very good”; by contrast 43% of MDs and 32% of NPs said the same of working relationships between MDs and nurse trainees.

In multivariate regression analysis (detailed findings in Supplement), perceived role clarity was significantly associated with increased perceptions of excellent teamwork and disaster preparedness among all clinicians. Positive working relationships did not predict improvements in perceived teamwork but were significantly associated with more positive ratings of disaster preparedness. Working in a hospital that is a teaching hospital for nurses was also significantly associated with increased perceived excellence in teams. State scope of practice was not significantly associated with any outcome.

Scope of Practice in Clinical Activities

MD and NP reports of clinical activities and procedures that are performed by NPs are shown in Table 3. Only for clinicians who report working in units where both types of professionals are employed. NPs and MDs differ significantly on most items, although the majority in both specialty areas report that NPs provide a wide range of clinical services. ICU/CCU NPs, unlike Emergency/Trauma NPs, commonly participate in code response teams, central line insertion and end-of-life planning. Among MDs and NPs, the least frequent NP activities include leading team rounds, intubation, spinal or joint taps, and carrying an on-call beeper.

Perceptions of Scope of Practice Policy

Table 4 shows NP and MD attitudes about NP scope of practice, including comparable data for some items from our prior study of primary care NPs and MDs. While clinicians find broad agreement with the IOM stated principle that “nurse practitioners should be allowed to work to the full extent of their education and training,” significant disagreement exists about expanded scope for NPs with respect to hospital admitting privileges and payment for services. While scope of practice is presently legislated at a state level, 81% of NPs and 55% of MDs agreed scope of practice should be defined by national rather than state policy.

Discussion

These data provide a cross-sectional view of clinical professional teamwork by NPs and MDs in our nation’s emergency rooms, intensive, and critical care units. These data have important implications for both clinical practice and state/federal policy.

Implications for Clinical Care and Leadership

In clinical settings, several findings emerge as important for health care leaders to consider. First, considerable variation was reported in how teams in these units are composed, who leads them, and how they do their work. Despite significant differences reported by NPs and MDs in several areas (Table 3), more than two thirds of NPs surveyed were not only performing core clinical evaluation and management activities, but also procedures for wounds and abscesses (66%) and work with patients and families on palliative and end-of-life planning (75%). Approximately 25% to 40% worked in procedurally intensive, emergency, and critical/intensive care tasks, including spinal and joint taps (33%), intubation (34%), central line insertions (43%), activities that historically might be observed in the exclusive domain of MD practice.

Second, in clinician responses to a series of team assessment measures (Table 2), we noted several significant differences between NPs and MDs in clarity of roles, excellence of teamwork, perceived quality of care and other issues. Therefore, it was surprising and discouraging that the one point where there were no significant differences was that only 4 in 10 in each professional group reported that their teams were prepared to cope with a disaster or crisis. Importantly, in our multivariate models, self-reported lack of role clarity is one predictor of this perception, as was reported lack of excellent teamwork in these units.

Third, while many studies of care provided by NPs have shown the care they provide to be of similar or better quality in many services (McCleery et al., 2020; Swan et al., 2020), there continues to be a dissonance between the perceptions of MDs and NPs on this point (Poghosyan & Liu, 2016). As in our earlier survey of primary care MDs and primary care NPs, in the present study 62% of MDs and 5% of NPs reported that they believe MDs provide higher quality care than NPs when performing similar clinical services. Recently available data from one of the author’s institutions reveals similar outcomes in nurse-led medical intensive care units and resident units (Donelan et al., 2013; Buerhaus et al., 2014). As clinical leaders consider the implementation of evidence-based practices, these perceived differences may impact the response of frontline clinicians to changes in these environments. It may be useful to encourage NPs and MDs to discuss their perceptions of the quality of care provided by each other and determine if such perceptions interfere with effective teamwork or pose barriers to innovation and change in units.

Finally, given the rapid expansion of the NP workforce, and the reported similarity in some clinical activities performed by both NPs and MDs, some level of interprofessional conflict may be inevitable.
Table 3 – Roles of NPs in Units

| Role                                                                 | ALL                        | Emergency/Trauma          | ICU/CCU                    |
|----------------------------------------------------------------------|----------------------------|----------------------------|----------------------------|
|                                                                      | MD in collaborative unit   | NP                         | MD                         | NP                         | MD                         | NP                         | p value |
|                                                                      | N= 292                     | 338                        | p value                    | N= 177                     | 149                        | p value                    | N= 137                     | 204                        | p value |
| In my unit, NPs                                                      |                            |                            |                            |                            |                            |                            |                            |                            |                            |
| Take history and perform physical examinations                      | 249 85%                   | 321 95%                   | <.0001                     | 157 89%                    | 145 97%                   | 0.003                      | 109 80%                    | 191 94%                   | <.0001 |
| Formulates and implements treatment plans for management of acute illnesses | 225 77%                   | 324 96%                   | <.0001                     | 143 81%                    | 146 98%                   | <.0001                     | 99 72%                     | 192 94%                   | <.0001 |
| Orders and interprets results of laboratory studies                  | 258 88%                   | 335 99%                   | <.0001                     | 158 89%                    | 149 100%                  | <.0001                     | 120 88%                    | 201 99%                   | <.0001 |
| Orders professional consultations                                   | 214 73%                   | 314 93%                   | <.0001                     | 127 72%                    | 138 93%                   | <.0001                     | 103 75%                    | 190 93%                   | <.0001 |
| Prescribes appropriate medications                                  | 251 86%                   | 335 99%                   | <.0001                     | 154 87%                    | 149 100%                  | <.0001                     | 118 86%                    | 201 99%                   | <.0001 |
| Explains procedures (necessity, preparation, nature, effects) to patients, patient’s family | 248 85%                   | 327 97%                   | <.0001                     | 152 86%                    | 148 99%                   | <.0001                     | 116 85%                    | 194 95%                   | 0.001  |
| Works with patient and family on palliative care and end of life planning | 166 57%                   | 255 75%                   | <.0001                     | 70 40%                     | 85 57%                    | 0.002                      | 113 82%                    | 184 90%                   | 0.037  |
| Performs spinal or joint taps                                        | 64 22%                    | 111 33%                   | 0.002                      | 42 24%                     | 66 44%                    | <.0001                     | 25 18%                     | 52 25%                    | 0.117  |
| Performs basic procedures for wounds and abscesses (sutures, debridement, drain ulcers) | 188 64%                   | 223 66%                   | 0.676                      | 148 84%                    | 142 95%                   | 0.001                      | 55 40%                     | 96 47%                    | 0.208  |
| Performs intubation                                                  | 49 17%                    | 116 34%                   | <.0001                     | 15 8%                      | 44 30%                    | <.0001                     | 36 26%                     | 79 39%                    | 0.017  |
| Inserts central lines (subclavian, internal jugular)                 | 73 25%                    | 145 43%                   | <.0001                     | 21 12%                     | 40 27%                    | 0.0006                     | 62 45%                     | 115 56%                   | 0.044  |
| Leads unit team rounds                                              | 18 6%                     | 107 32%                   | <.0001                     | 3 2%                       | 35 23%                    | <.0001                     | 17 12%                     | 82 40%                    | <.0001 |
| Interprets EKGs                                                     | 113 39%                   | 284 84%                   | <.0001                     | 52 29%                     | 115 77%                   | <.0001                     | 74 54%                     | 184 90%                   | <.0001 |
| Response to emergencies RRT/codes                                    | 91 31%                    | 223 66%                   | <.0001                     | 38 21%                     | 58 39%                    | 0.0006                     | 69 50%                     | 178 87%                   | <.0001 |
| On call (carries beeper) on nights and weekends                      | 44 15%                    | 114 34%                   | <.0001                     | 12 7%                      | 31 21%                    | 0.0002                     | 39 28%                     | 93 46%                    | 0.002  |
One of the more sobering findings in our analyses were reported perceptions of difficult working relationships between MDs and nursing trainees, and NPs and medicine trainees. As we educate the next generation of clinicians, we should ask what messages are being conveyed about professionalism and mutual respect in interprofessional context and assure that more junior colleagues are supported as they learn.

**Implications for Policy**

Two findings from this study of inpatient Emergency, ICU and CCU clinicians may inform ongoing state debates about expanding scope of practice for NPs. 55% of MDs and 31% of NPs agreed that physicians with whom they work support state restrictions on NP scope of practice. While legislative battles about scope of practice continue in many US states, a majority of MDs (51%) and most NPs (81%) support making scope of practice policy at a federal rather than state level. During the current COVID-19 epidemic, the need to move ICU trained professionals across state lines to meet hotspot demands for care, and the considerable expansion of the use of telehealth have highlighted calls for national licensure and credentialing are underscored in HHS Secretary’s March 2020 guidance to the states. (National Council of State Boards of Nursing, 2020) Continued discussion of these policies will likely continue when the pandemic crisis abates.

Our research has a few limitations. The sample sources for MD and NP data did not contain sufficient data to target health professionals by specialty and work setting. We used our questionnaire to screen for both to assure that the respondents were eligible to complete the survey. Our sample was too small to control for all clinician characteristics; some regression analyses are limited by this factor. Of note, however, differences between NPs and MDs are highly significant on many outcomes, even with samples of this size. Measuring “team” proved complex as team composition is not always static in hospital units. The word “team” has become widely used in health care—in our changing system with sometimes overlapping and evolving roles and differences in reported role clarity across professions further research is needed to understand optimal team configurations. Despite our extensive efforts to develop and test our questionnaire, all surveys are subject to item and response bias. Finally, these are self-reported data on clinical activities in hospital settings. Due to varying billing and payment practices for hospital care, it is difficult to validate the accuracy of reports on the clinical activities in administrative data for national samples.

The current COVID-19 pandemic will add further pressure and stress on the health care system, the professionals who work in care delivery organizations,
and stress the formation of effective teams and working relationships between NPs and MDs. As professional education changes and affects roles and competencies, role conflicts are inevitable, and lack of role clarity may lead to challenges within teams. The sickest patients in our institutions require increasingly complex and coordinated care. Understanding who can best provide services effectively in different environments will require leaders of health care professions and organizations to engage with one another to further interprofessional education and practice. Further efforts are needed to ensure that professionals have clear roles and responsibilities and that teams are both prepared to provide the highest quality and efficient care for the needs of the population and to respond with coordinated effectiveness in crises.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.outlook.2020.04.010.

References

Assessing Progress on the IOM Report The Future of Nursing: Health and Medicine Division. Retrieved from http://nationalacademies.org/hmd/reports/2015/assessing-progress-on-the-iom-report-the-future-of-nursing.aspx. Accessed April 9, 2020.

Biddinger, PD, Baggish, A, Harrington, L, et al. (2013). Be prepared—The Boston marathon and mass-casualty events. *New England Journal of Medicine*, 368(21), 1958–1960, doi:10.1056/NEJMp1305480.

Brennan, SE, Bosch, M, Buchan, H, & Green, SE (2013). Measuring team factors thought to influence the success of quality improvement in primary care: A systematic review of instruments. *Implement Science*, 8, 20, doi:10.1186/1748-5908-8-20.

Donelan, K, DesRoches, C, Dittus, R, & Buerhaus, P (2017). Perspectives of physicians and nurse practitioners on primary care practice. *N Engl J Med*, 368(20), 1898–1906, doi:10.1056/NEJMsa1212938.

Buerhaus, PI, DesRoches, CM, Dittus, R, & Donelan, K (2014). Practice characteristics of primary care nurse practitioners and physicians. *Nurs Outlook*, 1–10, doi:10.1016/j.outlook.2014.08.008.

Ely, EW. (2017). The ABCDEF bundle. *Critical Care Medicine*, 45(2), 321–330, doi:10.1097/CCM.0000000000002175.

Gawande, A (2013). Why Boston’s hospitals were ready. *New Yorker*. Retrieved from https://www.newyorker.com/news/news-desk/why-bostons-hospitals-were-ready.

Hartog, CS, & Benbenishty, J. (2015). Understanding nurse-physician conflicts in the ICU. *Intensive Care Medicine*, 41(2), 331–333, doi:10.1007/s00134-014-3517-z.

House, S, & Havens, D. (2017). Nurses’ and physicians’ perceptions of nurse-physician collaboration: A systematic review. *Journal of Nursing Administration*, 47(9), 165–171, doi:10.1097/NNA.0000000000000460.

Hughes, AM, Gregory, ME, Joseph, DL, et al. (2016). Saving lives: A meta-analysis of team training in healthcare. *Journal of Applied Psychology*, 101(9), 1266–1304, doi:10.1037/apl0000120.

Institute of Medicine. (2001). *Crossing the quality chasm: A new health system for the 21st century*. Washington, D.C.: National Academies Press.

Leggat, SG (2007). Effective healthcare teams require effective team members: Defining teamwork competencies. *BMC Health Service Research*, 7(1), 17, doi:10.1186/1472-6963-7-17.

McClerey E, Christensen V, Peterson K et al. Evidence brief: The quality of care provided by advanced practice nurses. Washington, DC. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK384613/ _NBK384613_pubdet_.

National Council of State Boards of Nursing. HHS sends letter, guidance to states encouraging state licensing waivers, relaxation of scope of practice requirements. Retrieved from https://www.ncsbn.org/14566.htm. Accessed April 9, 2020.

Poghosyan, L, & Liu, J. (2016). Nurse practitioner autonomy and relationships with leadership affect teamwork in primary care practices: A cross-sectional survey. *Journal of General and Internal Medicine*, 31(7), 771–777, doi:10.1007/s11606-016-3652-z.

Stempniak, M. (2016). Lessons one orlando hospital learned from the deadliest mass shooting in U.S. History | H&HN. *Hospitals&Health Networks*. Retrieved from https://www.hhnmag.com/articles/7937-lessons-one-orlando-hospital-learned-from-the-deadliest-mass-shooting-in-us-history Accessed April 9, 2020.

Swan M, Ferguson S, Chang A, Larson E, Smaldone A. Quality of primary care by advanced practice nurses: A systematic review. 10.1083/ntqhc/mzv054.

The Future of Nursing: Leading change, advancing health : Health and Medicine Division. Retrieved from...
Valentine, MA, Nembhard, IM, & Edmondson, AC (2014). Measuring teamwork in health care settings. Medical Care, 53(4), 1, doi:10.1097/MLR.0b013e31827feef6.

Wahr, JA, Prager, RL, Abernathy, JH, et al. (2013). Patient safety in the cardiac operating room: Human factors and teamwork. Circulation. Retrieved from http://circ.ahajournals.org/content/early/2013/08/05/CIR.0b013e3182a38efa.short Accessed April 9, 2020.