The Distribution of Recommended Care Levels by Age, Gender, and Trauma vs Medical Classification within the Emergency Communication Nurse System

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ABSTRACT

Introduction: An examination of the Emergency Communications Nurse-determined Recommended Care Levels (RCLs), for calls transferred for secondary nurse-triage has not been performed. The outcome of such an investigation would help to gain a more complete picture of the type of care ultimately recommended for these patients. The Emergency Communications Nurse System (ECNS) studied contained 22 RCLs, ranging from urgent levels, including a country-specific 3-digit number *Emergency response (911)*, and *Emergency care as soon as possible* to less time-dependent, low priority levels, such as *Routine appointment with doctor* and *Self-Care/Home-Care*.

Objective: The objective in this study was to characterize the distribution of specific RCLs by age, gender, and by call type (i.e., trauma vs. medical), in two urban EMS dispatch centers using the ECNS.
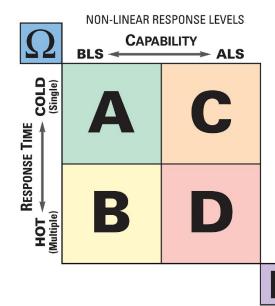
Methodology: This was a retrospective study involving case data collected at two metropolitan 911 dispatch centers in the United States.

Results: Of the MPDS protocols sent (by the EMD) to be triaged through the ECNS, the Sick Person and Falls protocols had notably high frequencies. Falls, Abdominal Pain, Back Pain, and Vomiting were overall the most frequently used protocols in the ECNS itself. Female patients were users of the ECNS in significantly greater numbers than males, particularly within the Abdominal Pain and Vomiting chief complaints.

Conclusion: Patients accessing 911 systems with low-acuity conditions and undergoing a secondary nurse-triage are predominantly female, over 50 years of age, and have more medical-related chief complaints than trauma-related. Almost a third of all the patients triaged through the ECNs received alternative RCLs other than receiving an *Emergency response (911)* or being sent to the *Emergency care as soon as possible* RCL. Both centers documented a low percentage of *Emergency response (911)* RCL.

INTRODUCTION

The Emergency Communication Nurse System (ECNS™) is a computerized telephone patient assessment process, completed by a certified Emergency Communication Nurse (ECN) that can be used for secondary triage of low-acuity 911 calls. In over 2,900 medical dispatch centers distributed throughout 43 countries around the world, emergency medical calls are triaged by trained and certified emergency medical dispatchers (EMDs). Using the automated Medical Priority Dispatch System (MPDS®) software, ProQA™, the EMD assigns specific determinant codes which represent the patient chief complaint, response urgency/level (OMEGA [lowest], ALPHA, BRAVO, CHARLIE, DELTA, and ECHO [highest]), and acuity, as determined by the EMD's primary assessment (Figure 1). Some of these cases coded as low acuity by the EMD, are candidates for non-ambulance care.[1-3] The ECN, when situated in the 911 center, can make a final determination as to the type of care the patient receives.

Once the EMD assigns the case an approved "nurse-eligible" low-acuity determinant code (within the OMEGA and ALPHA Priority-level calls), the caller is transferred immediately to the ECN, who provides the secondary patient assessment (Figure 2). This assessment begins with the ECN selecting one of the 211 problem-

NON-LINEAR RESPONSE LEVELS
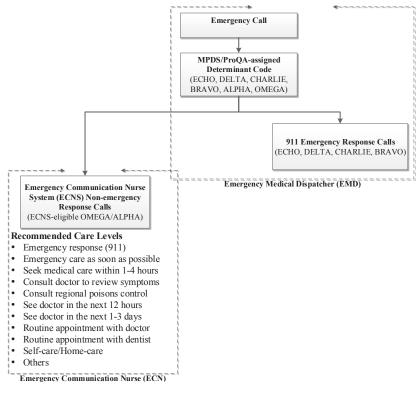
OMEGA (Ω) definition
Approved low acuity conditions qualifying for **non-EMS response referrals** to quality-assured nurse assessment systems, and other external specialty agencies such as Poison Control Centers, rape Crisis Lines, Suicide and Mental Help Lines, Social Services, and Clinics.

ECHO (E) definition
Conditions requiring **very early recognition and immediate dispatch** of the absolute closest response of **any trained crew** such as police with AEDs, fire ladder or snorkel crews, HazMat units, or other specialty teams not in the standard medical response matrix.

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Figure 1. Medical Priority Dispatch System Response Matrix

MPDS: Medical Priority Dispatch System

Figure 2. EMD and ECN Emergency Call Triaging Process

specific (chief complaint) protocols within the automated ECNS system, then asking and entering the answers to a series of complaint-specific questions, designed to direct the ECN through a logic-based decision support process, resulting in the ECN determining the Recommended Care Level (RCL): the optimal level of care, including a clinically sound time-frame for receiving care.

A recently published study from Scott et al, examined the distribution of chief complaints and determinant codes selected by the EMD from the nurse-eligible subset of low acuity cases, as well as the distribution of (chief complaint) protocols selected by the ECN for those same cases.[4] Patient gender was also examined by frequency.

Based on that study's results, a basis for understanding

the different patient conditions that are most likely to be handled by an ECN in a 911 medical dispatch center was established. This research paper conducts a thorough examination of the ECN-determined RCLs to gain a more complete picture of the type of care ultimately recommended for these patients. The current version of the ECNS contains 22 RCLs, ranging from urgent levels, including *Emergency response* (which is a country-specific 3-digit number e.g., 911, 999, 000, 144 and 112), and *Emergency care as soon as possible* to less time-dependent, low priority levels, such as *Routine appointment with a Doctor* and *Self-Care/Home-Care*.

OBJECTIVE

The objective in this study was to characterize the distribution of specific RCLs by age, gender, and by call type (i.e., trauma vs. medical–whether protocols selected were of medical or trauma/ injury classification), in two urban EMS dispatch centers using the ECNS.

METHODS

Design and setting

This was a retrospective study involving case data collected at two metropolitan 911 dispatch centers in the United States: Louisville Metro EMS (LMEMS), Louisville, Kentucky (KY), and MedStar, Fort Worth, Texas (TX). From these two centers, data were collected using the two software systems used – ProQA™, which contained the content of the MPDS for the initial 911 triage completed by the EMDs – and PSIAM (Priority Solutions Integrated Access Management), which contained the content of the ECNS used by the ECNs for the secondary nurse triage process. The initial EMD 911 triage of the cases yielded a mix of cases within the two MPDS low-acuity priority levels known as ALPHA-level and OMEGA-level calls.

Study population

The study data was a convenience sample, collected from the inception of the ECN program in each center until the start of the study. The data was originally collected for use in a previous study.[4] The data was collected during the following timeframes: LMEMS center between April 10, 2010 and December 31, 2013, service hours being 8 am to 8 pm Mondays to Friday and 8am to 4pm on Saturdays. MedStar center between May 20, 2012 and December 31, 2013, service hours being 9 am to 5pm Mondays to Fridays.

Outcome measures

The outcome measure was the frequency of the specific RCL types assigned to each patient by the ECN. The distributions of the RCLs were classified by patient age, gender, and call type (trauma vs. medical).

Data analysis

STATA for Windows® software (STATA Statistical Software: Release 13.1©2013, StataCorp, College Station, TX, USA) was used for data analysis. The distribution of cases was presented by age and RCL categories, overall and by study center. The non-parametric Two-sided Fisher's Exact test was used to assess the significance of the differences observed between study centers, at 0.05 significance level. The frequency of each RCL type was then generated by patient gender and call type (trauma vs. medical). The median age (including 25th and 75th quartiles) for patients under each RCL was then estimated.

RESULTS

A total of 6,727 cases were included in the study, with a majority (89.6%) from LMEMS (Table 1a). Overall, the population was predominantly female (60.3%), age 16 years and older (93.1%) with a majority (55.1%) being in the 16-64 year age range. Additionally, although a majority of calls were medical (77.2%), female gender was not significantly associated with call category (60.9% of the medical and 58.3% of the trauma calls were female, p=0.070).

In all but, *Self/Home care* RCL (where the majority (58.0%) of the patients were age 65 years and older), most of the patients were age 16-64 years (range: 50-84%). A total of 61.4% (207/337) of all the patients who received a RCL of *Self/Home care* were classified as trauma/injury-related call. Overall, 37.2% were safely triaged to alternative destinations rather than being referred to the Emergency Department (63.5% for MedStar, and 34.2% from LMEMS).

Focusing only on three major age categories (i.e., patients younger than 16 years, those 16-64 years, and those older than 64 years), overall, approximately 7.0% of the patients were younger than 16 years, 55.0% age 16-64 years, and 38.0% were older than 64 years (Table 1b). In LMEMS, 6.0% of the patients were younger than 16 years, 53.0% age between 16 and 64 years, and 41.0% were older than 64 years. However, in MedStar, 15.0% of the patients were younger than 16 years, 71.0% age between 16 and 64 years, and 14.0% were older than 64 years.

Otherwise, the *Consult doctor to review symptoms* RCL had the highest percentage (17.3%) of patients who were younger than 16 years, *Routine appointment with dentist* RCL had the highest percentage (84.6%) of patients age 16-64 years, and *Self-care/Home-care* RCL had the highest percentage (57.9%) of patients who were older than 64 years.

Additionally, in LMEMS, again the *Consult doctor to review symptoms* RCL had the highest percentage (12.1%) of patients who were younger than 16 years, *Routine appointment with dentist* RCL had the highest percentage (90.0%) of patients age 16-64 years, and *Routine appoint with doctor* RCL had the highest percentage (44.2%) of patients who were older than 64 years. However, in MedStar, the *Consult doctor to review symptoms* RCL had the highest percentage of patients who were younger than 16 years (27.5%) and patients older than 64 years (31.4%), and 90.5% of the patients who were assigned the *Emergency response (911)* RCL were age 16-64 years.

Measure		Distribution: n (%)			
		Overall (N=6,727)	LMEMS (N=6,028)	MedStar (N=699)	P*
Gender	Female	4,056 (60.3)	3,663 (60.8)	393 (56.2)	0.020
Age	<3 months	21 (0.31)	17 (0.28)	4 (0.57)	
	3-12 months	75 (1.1)	58 (0.96)	17 (2.4)	
	1-4 years	171 (2.5)	121 (2.0)	50 (7.2)	<0.001
	5-16 years	197 (2.9)	164 (2.7)	33 (4.7)	
	16-64 years	3,709 (55.1)	3,212 (53.3)	497 (71.1)	
	65+ years	2,554 (38.0)	2,456 (40.7)	98 (14.0)	
Call category	Medical	5,195 (77.2)	4,592 (76.2)	603 (86.3)	<0.001
Recommended Care Level (RCL)	Emergency response (911)	276 (4.1)	255 (4.2)	21 (3.0)	
	Emergency care as soon as possible	4,223 (62.8)	3,968 (65.8)	255 (36.5)	
	Seek medical care within 1-4 hours	805 (12.0)	690 (11.5)	115 (16.5)	
	Consult doctor to review symptoms	150 (2.2)	99 (1.6)	51 (7.3)	
	Consult regional poison control	4 (0.06)	4 (0.07)	0 (0.0)	
	See doctor in the next 12 hours	421 (6.3)	277 (4.6)	144 (20.6)	<0.001
	See doctor in the next 1-3 days	250 (3.7)	199 (3.3)	51 (7.3)	
	Routine appointment with doctor	227 (3.4)	190 (3.2)	37 (5.3)	
	Routine appointment with dentist	13 (0.19)	10 (0.17)	3 (0.43)	
	Self-care/Home-care	337 (5.0)	318 (5.3)	19 (2.7)	
	Others‡	21 (0.31)	18 (0.30)	3 (0.43)	

*Fisher's exact test p-value assessing significance of inter-agency difference. ‡Includes all other RCLs such as community crisis line, police, obstetrician/gynecologist, and social services.

Table 1a. Characteristics of the study cases

Generally, the type of RCL was significantly associated with higher percentage of medical call type (p<0.001) (Table 2). There was not a statistically significant association between RCL and patient gender.

Overall, the median age of the patients being referred to the nurse for secondary triage was 55.1 years which was higher than the median age for patients calling 911 (50.0 years median age). Mean age for those patients referred to the nurse for secondary triage was significantly different by gender (56.5 years for females and 53.4 years for males; p=0.001) and by call type (53.5 years medical and 60.0 years for trauma; p<0.001).

The youngest patients (29.3 years median age) most commonly received the *Routine appointment with dentist* RCL and those who most commonly received *Self-care/Home-*

care RCL were much older (70.0 years median age). The youngest among female and male patients were those who received *Routine appointment with dentist* RCL (29.3 years and 29.2 years, respectively). However, the oldest among female and male patients were those who received *Self-care/Home-care* RCL (72.7 years and 64.4 years, respectively).

The top three MPDS Chief Complaints (CCs) which recorded the highest percentage of patients who were assigned *Self-care/Home-care* RCL were: *Choking* (32.0% [18/56]), *Falls* (14.0% [197/1,365]), and *Animal Bites*/Attacks (8.0%). However, out of all the patients who were assigned *Self-care/Home-care* RCL (n=337), the top three CCs which had the highest percentage of cases were: *Falls* (59% [n=197]), *Sick Person* (Specific Diagnosis) (24.0% [n=80]), and *Choking* (5.0% [n=18]).

Recommended Care Level (RCL)	Age: n (%*)			
	N	<16 years	16-64 years	>64 years
	(n=6,727)	(464 (6.9%))	(3,709 (55.1%))	(2,554 (38.0%))
Emergency response (911)	276	14 (5.1)	181 (65.6)	81 (29.4)
Emergency care as soon as possible	4,223	230 (5.5)	2,255 (53.4)	1,738 (41.2)
Seek medical care within 1-4 hours	805	78 (9.7)	519 (64.5)	208 (25.8)
Consult doctor to review symptoms	150	26 (17.3)	66 (44.0)	58 (38.7)
Consult regional poison control	4	0 (0.0)	2 (50.0)	2 (50.0)
See doctor in the next 12 hours	421	50 (11.9)	276 (65.6)	95 (22.6)
See doctor in the next 1-3 days	250	15 (6.0)	153 (61.2)	82 (32.8)
Routine appointment with doctor	227	14 (6.2)	122 (53.7)	91 (40.1)
Routine appointment with dentist	13	1 (7.7)	11 (84.6)	1 (7.7)
Self-care/Home-care	337	35 (10.4)	107 (31.8)	195 (57.9)
Others†	21	1 (4.8)	17 (81.0)	3 (14.3)

*Total percentages may slightly exceed 100% due to rounding off. †Includes all other RCLs such as community crisis line, police, obstetrician/gynecologist, and social services.

Table 1b. Recommended Care Level by three major patient age categories

DISCUSSION

There were a number of commonalities between the two centers studied -- the patient population was predominantly female, above 50-years old, had medical complaints more often than trauma-related complaints, and female patients were older than their male counterparts. Regarding gender, unpublished 911 data, from the centers studied, for the same period as the study, showed a similar (although not as pronounced) gender distribution (with just a slightly higher percentage of females vs males accessing 911: 53.7% and 46.3%; p=0.256, respectively) for all 911 calls triaged by EMDs, regardless of whether or not they were coded as a low-acuity (nurse-eligible) cases.[5]

Almost a third of all the patients triaged by the ECNs received alternative RCLs other than receiving an *Emergency response (911)* or being sent to the Emergency Department. One center's percent of *Emergency care as soon as possible* disposition (36.5%) is comparable with unpublished data from centers in the UK where 38.9% is the norm.[6] In other words, a reasonable proportion of calls were safely triaged to alternative destinations rather than being referred to the Emergency Department (37.2% overall; 63.5% for MedStar, and 34.2% for LMEMS). Nevertheless, further research is needed to determine the causes of this difference since the second center had an *Emergency care as soon as possible* referral rate of 65.8%, although likely possibilities include: 1) a difference in compliance to protocol between the ECNs in the two agencies, and/or 2) a difference in the mix of determinant codes (including chief complaint types) received by the two agencies' ECNs. Notably, one

agency had selected from the IAED approved code-set a larger set of different Falls determinant codes approved to be passed to the ECN for secondary triage, meaning that proportionally more Falls cases were handled by that center. Previously unpublished data (from other centers) suggested that Falls has a relatively high frequency of the *Emergency care as soon as possible* RCL, ranging between 29% and 64% for the various MPDS determinant codes[6]. As one would expect, Falls is a rather generic chief complaint that has its share of common complications that cannot easily be treated outside of the hospital environment. For example, conditions such as hip fractures, angulated extremity fractures, rib fractures, and possible head injuries generally require non-ambulatory transport to a hospital emergency department for evaluation and treatment. 3) One agency might have more alternative resources available, other than taking the patient to the ED, for example having access to more Urgent Care Centers.

Regarding patient age, one traditional line of thought among medical call centers is to exclude from secondary nurse triage and send an ambulance directly on all children under age 16, and patients older than 64 years, due to a perceived higher risk for both the young, and elderly. This perception may stem from a young child's inability to effectively present their symptoms (poor historians) in some instances, and comorbidities or polypharmacy in the upper age ranges. Wheeler, in her nurse triage course Telephone Triage: Roles, Tools, and Rules, mentions "frequent callers are often from high-risk age groups: the very young, the frail elderly, and women of childbearing age".[7]

Agency	Recommended Care Level	N	Female n (%)	Age in years Median (Q1, Q3)*	Medical calls n (%)
LMEMS (n=6,028)	Emergency response (911)	255	153 (60.0)	51.9 (29.6, 69.6)	236 (92.6)
	Emergency care as soon as possible	3,968	2,399 (60.5)	58.6 (36.8, 77.8)	3,025 (76.2)
	Seek medical care within 1-4 hours	690	427 (61.9)	48.6 (28.9, 67.3)	513 (74.4)
	Consult doctor to review symptoms	99	66 (66.7)	59.3 (36.0, 73.9)	94 (95.0)
	Consult regional poison control	4	2 (50.0)	59.8 (43.5, 76.8)	4 (100.0)
	See doctor in the next 12 hours	277	170 (61.4)	48.2 (29.3, 69.6)	249 (89.9)
	See doctor in the next 1-3 days	199	122 (61.3)	55.2 (35.8, 77.8)	155 (77.9)
	Routine appointment with doctor	190	110 (57.9)	56.9 (38.5, 80.3)	175 (92.1)
	Routine appointment with dentist	10	5 (50.0)	30.2 (23.6, 40.8)	10 (100.0)
	Self-care/Home-care	318	198 (62.3)	71.1 (50.0, 82.0)	114 (35.9)
	Others†	18	11 (61.1)	31.5 (24.5, 56.7)	17 (94.4)
MedStar (n=699)	Emergency response (911)	21	13 (61.9)	39.0 (23.8, 57.1)	20 (95.2)
	Emergency care as soon as possible	255	157 (61.6)	39.8 (24.7, 58.5)	208 (81.6)
	Seek medical care within 1-4 hours	115	58 (50.4)	40.9 (20.3, 55.8)	93 (80.9)
	Consult doctor to review symptoms	51	27 (52.9)	52.3 (4.0, 67.8)	51 (100.0)
	Consult regional poisons control	**	**	**	**
	See doctor in the next 12 hours	144	78 (54.2)	29.0 (20.2, 48.4)	127 (88.2)
	See doctor in the next 1-3 days	51	29 (56.9)	46.1 (27.6, 55.9)	48 (94.1)
	Routine appointment with doctor	37	20 (54.1)	48.1 (35.2, 57.3)	34 (91.9)
	Routine appointment with dentist	3	2 (66.7)	27.3 (26.1, 79.4)	3 (100.0)
	Self-care/Home-care	19	8 (42.1)	8.0 (2.3, 55.3)	16 (84.2)
	Others†	3	1 (33.3)	60.1 (20.8, 88.3)	3 (100.0)
Overall (n=6,727)	Emergency response (911)	276	166 (60.1)	50.0 (28.9, 67.0)	256 (92.8)
	Emergency care as soon as possible	4,223	2,566 (60.5)	57.3 (35.3, 77.2)	3,233 (76.6)
	Seek medical care within 1-4 hours	805	485 (60.3)	47.1 (27.2, 64.9)	606 (75.3)
	Consult doctor to review symptoms	150	93 (62.0)	56.5 (29.0, 70.9)	145 (96.7)
	Consult regional poison control	4	2 (50.0)	59.8 (43.5, 76.8)	4 (100.0)
	See doctor in the next 12 hours	421	248 (58.9)	42.5 (24.3, 61.9)	376 (89.3)
	See doctor in the next 1-3 days	250	151 (60.4)	53.0 (33.3, 71.3)	203 (81.2)
	Routine appointment with doctor	227	130 (57.3)	55.6 (36.4, 78.2)	209 (92.1)
	Routine appointment with dentist	13	7 (53.9)	29.3 (26.1, 40.8)	13 (100.0)
	Self-care/Home-care	337	206 (61.1)	70.0 (48.4, 81.4)	130 (38.6)
	Other†	21	12 (57.1)	32.8 (24.5, 60.0)	20 (95.2)

LMEMS: Louisville EMS. *The 25th (Q1) and 75th (Q3) percentiles for median patient age. **Data missing. †Includes all other RCLs such as community crisis line, police, obstetrician/gynecologist, and social services.

Table 2. Recommended Care Level by gender, age, and call category

Notably, neither of the two EMS call centers studied had policies in place to exclude these age groups from ECN evaluation. Yet against expectations, a higher percentage of patients in the 16-64 year age range received an *Emergency response (911)* when compared to those in the age ranges less than 16 years and older than 64 years of age. The MPDS system, however, may have already excluded many of the more unwell younger and older patients from secondary triage in the first place. At the upper end of the age spectrum, the lowest-acuity RCL *Self-care/Home-care* proved to have a higher median age (71.1 years) and a greater than average percentage of cases in the above 64 years age range – again defying the conventional wisdom that increasing age is always a good predictor of more severe, higher risk patients.

The greater number of the elderly in the trauma category, however, appears to indicate that older patients are more at risk for trauma or falls that result in calling 911. Additionally, younger patients/callers may just be more mobile with greater resources and can make their own way to hospital instead of calling 911. Another important finding that bodes well for the use of ECNS in the 911 center is the relatively low percentage of cases directly returned to 911 for ambulance response. The overall 4% figure is much more favorable than 911 return rates encountered in earlier studies: Dale et al[8] in 2003 found 48% of their 'low acuity' calls being triaged as requiring an emergency ambulance. O'Cathain et al[9] documented levels of between 21% and 31% of these low acuity calls requiring emergency ambulance responses. Further research into this relatively small cohort of patients is needed to establish the reason for these patients to be initially classified as low-acuity patients by the EMD, then re-triaged as requiring an ambulance response by the ECN. This will include the evaluation process (what might be being missed), the compliance factors (case review, feedback and continued medical education) and the identification of what otherwise low acuity clinical problems ultimately needing transport because of pain and or immobility.

Given that the majority (92.8%) of the patients receiving a 911 disposition (ambulance response) and 75.6% of patients receiving *Emergency care as soon as possible* RCL were classified as having symptoms of a medical nature, it is clear that the majority of calls classified as traumatic injuries are indeed of lower acuity.

LIMITATIONS

We used a convenience sample from both centers, with a substantially larger proportion of the cases coming from one of the two centers that had the higher call load and the longer duration of ECNS use, since the two agencies started the ECNS program in different years. This sample size difference skewed the aggregate data (when data from both centers is combined in our tables). Neither center had 24/7 ECN staffing, both using only ambulance response as an option for low-acuity cases during the hours and days when no ECN was available in the center. Weekend hours had sparser staffing than hours on weekdays. These factors could have an impact on the types of calls received in centers where the chief complaint and type of caller may fluctuate by hour of the day, or day of the week. Compliance to ECNS protocol was checked periodically, and varied significantly between centers for part of the duration of the study, which could affect the accuracy of ECN assignment of the RCL.

CONCLUSIONS

Patients accessing 911 systems with low-acuity conditions and undergoing a secondary nurse-triage are predominantly female, over 50 years of age, and have more medical-related chief complaints than trauma-related. Almost a third of all the patients triaged through the ECNs received alternative RCLs other than receiving an *Emergency response (911)* or being sent to the *Emergency care as soon as possible* RCL, but there was a significant difference in the percent of *Emergency care as soon as possible* RCL between the two centers. Both centers documented a low percentage of (911) *Emergency response (911)* RCL - in fact, significantly lower than other studies published in the literature. With both proper primary triage by EMDs, and secondary nurse triage from a trained ECN, a subset of 911 calls can be correctly triaged to low acuity, and those cases can be managed without an emergency ambulance response. Future studies should examine the effect of ECN protocol compliance on the selection of an RCL, and the effect of 24/7 staffing on RCL assignment.

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