Enhancements to the ED component of CACS methodology

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Project goals

- **Review the ED component of CIHI's CACS grouping system**

  – Assignment of ED cells and the RIW calculation methodology

- **Explore opportunities to improve the ED Grouper**

  – Identify options to improve CACS ability to reflect ED complexity and associated resource utilization

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Areas of Investigation for ED Grouper

- **Create a clinician panel to understand their expectations from an ED Grouper**

- **Review logic and labelling of CACS cells to ensure they are intuitive for ED clinicians**

- **Identify and test options to improve the performance of RIW model**

  – Improve predictive power of the RIW model

  – Explore option for an ED-specific RIW model

- **Identify potential additional measures of ED complexity**

  – e.g. consultations, comorbidities, admission by ambulance, triage level, ICU admission, ED length of stay, homelessness

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Overview of ED logic in CACS grouper
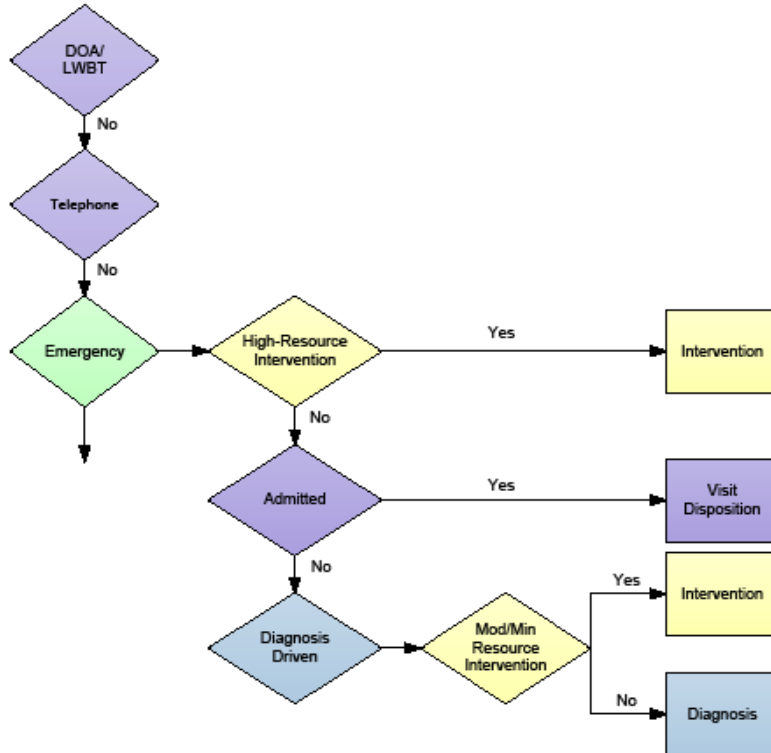
- **ED patients are classified into 3 main categories**

  - **Intervention partition**: visits with a high resource intervention (6 cells)

  - **Admission partition**: admitted patients (9 cells)

  - **Diagnosis partition**: diagnosis-driven cells (50)

Overview of CACS ED RIW methodology

- **Regression models using all the ambulatory care patient population**

  – Not specific for ED patients

  – Also includes day surgery and outpatient clinic visits

- **RIWs are derived based on:**

  – **CACS cells**: interventions and diagnosis

  – **Age factor**: 0 to 7 years, 8 to 17 years, 18 to 59 years and 60+ years

  – **Anaesthetic factor**: general, local, unmonitored, other, no anaesthetic

  – **Investigative technology factor**: 16 ITs, including CT scan, MRI, ECG, Xray and Ultrasound

  – **Interaction terms**: CACS cells and age/anaesthetic, ITs

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Feasibility study: goals

- **Understanding and analyzing ED cost data**

- **Exploring the possibility of using presenting complaints to assign ED cases**

  - The advisory group strongly suggested to use presenting complaints (PC)

- **Identifying 2-3 additional variables to capture variation in patient complexity**

- **Developing preliminary ED-specific RIW models**

  - Incorporate additional variables in the regression models

- **Exploring opportunities to modify the logic of the grouper**

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Using presenting complaints for CACS cells assignment

PC name	# CACS cells associated with the PC	Average cost of the PC	min and max of avg. costs
Abdominal pain	65	$412	$110 - $950
Chest pain - cardiac features	64	$405	$102 - $1,102
Shortness of breath	64	$181	$52 - $1,000
Upper extremity injury	60	$191	$38 - $2,470
Lower extremity injury	59	$421	$22 - $2,055
Lower extremity pain	62	$224	$72 - $1,605
Fever	63	$285	$108 - $1,391
Cough/congestion	61	$205	$103 - $1,186
Back pain	61	$256	$110 - $3,808
Head injury	63	$253	$63 - $1,469

- Top 10 (out of 173) presenting complaints in 2018, province of Ontario
- Total of 65 cells for ED cases
- Each PC is associated with almost all cells
- There are large variations in average costs of CACS cells associated with each PC

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Potential ED complexity measures

- **Clinical data: 9,005,157 records in 2018 – overall average cost of $299**

Variable	Category	Volume (%)	Average cost
Arrival by ambulance	Yes (air, ground or both)	15%	$479
	No (no ambulance)	85%	$259
Admission	Yes (all admitted patients)	11%	$637
	No (not admitted)	89%	$251
Consultations with other physicians	0 consultation	93%	$269
	1 consultation	6%	$637
	2+ consultations	< 1%	$847
Homelessness	Yes	1%	$362
	No	99%	$298

- The average cost is relatively higher for patients who arrived by ambulance and those admitted as inpatient
- Having a consultation increases the average cost considerably
- Slightly higher costs for homeless clients, however sample relatively small

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Preliminary ED-specific RIW models

Predictors included	R squared
Baseline model: 65 CACS cells, age groups, indicators for AT and IT, interaction terms	0.4923
Baseline model + indicator for arrival by ambulance	0.5017
Baseline model + indicator for consultation	0.5004
Baseline model + indicator for homelessness	0.4884
54 CACS cells, age groups, indicators for AT and IT, interaction terms + indicator for inpatient admission	0.5118

– The performance of the baseline model is not as high as we would prefer – goal is to identify ways to further explain variation in costs

– Additional complexity measures did not greatly improve the performance of the baseline model to explain cost variation

   - variation in costs in the ED is smaller overall

   - may not have the right clinical or cost data to improve overall model performance

– While these variables didn't help explain variation in costs, are they worthwhile including in grouper from a clinical perspective?

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Next steps

- **Continue to explore opportunities to add more complexity measures in the model**

    - Combining mode of arrival and triage levels

    - Including comorbidities

    - Exploring other variables from the literature

- **Exploring opportunities to include new cost data sources**

    - e.g., physician costs

- **Exploring opportunities to modify the logic of the grouper**

    - Including additional variables that are clinically relevant

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