

# SEPSIS AT HOME

## Safe treatment of septic patients in the hospital at home model

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### 1 Introduction

Sepsis is a leading cause of hospital death in the United States and represents a significant burden to health care systems. The majority of hospitalized sepsis patients present in the Emergency Department (ED), resulting in over 850,000 annual ED visits.<sup>1</sup> Rapid recognition and timely delivery of treatment bundles followed by close reassessment remain cornerstones of sepsis management.<sup>2</sup> Because of this, Kaiser Permanente Northwest (KPNW) implemented a comprehensive decision support system in 2 hospitals. Over a 4-year period this pilot was associated with an improvement in SEP1 bundle performance from 68% to 82%.

#### References

- Yealy DM, Mohr NM, et al. Early Care of Adults with Suspected Sepsis in the Emergency Department and Out-of-Hospital Environment: A Consensus-Based Task Force Report. *Annals of Emergency Medicine*. 2021;78(1):1-19
- Evans L, Rhodes A, et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2021. *Critical Care Medicine*. 2021; 49(11): e1063-e1143

### 2 Aim

Our goal was to safely and effectively treat septic patients in the KP at Home model. We developed a novel hospital at home pathway for select low-risk sepsis patients, utilizing **standard** risk assessment criteria to determine eligible patients.

### 3 Introduction to KP at Home

In April 2020, with 4 weeks' notice, Kaiser Permanente of the Northwest (KPNW) and Medically Home (MH) partnered to develop and initiate a hospital at home care model called "KP at Home." This model provides hospital-level care at home, caring for a diverse set of diagnoses, as a substitute for traditional acute hospital care.

#### Staffing Structure

This model leverages state of the art technology to scale. The KP at Home staffing structure utilizes a virtual physician and nurse assigned to each patient. The physician and nursing teams leverage both virtual care technology and a supply chain of in-home vendors to care for their patients. In addition, a nurse practitioner is utilized to do in-home visits on a regular basis.

#### Supply Chain and Logistics

KP at Home uses a supply chain with vendors, when needed, to duplicate any element of a patient treatment plan required for medical level admission.

#### Technology

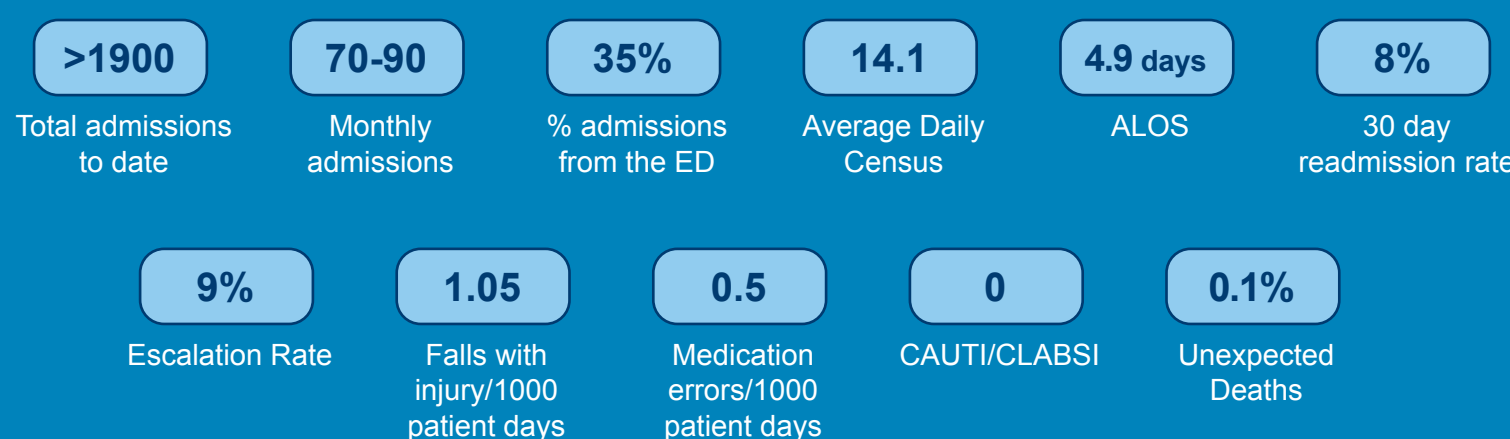
Every patient is provided with a set of technology installed at home consisting of:

- Tablet computer for clinical patient scheduling, video visits, and as a method of contacting a nurse 24/7;
- Telephone with direct line to nursing command center to provide a redundant method of communication;
- Wireless enabled vital sign equipment which downloads results to electronic health record: blood pressure cuff, pulse oximetry, thermometer and scale;
- Wireless WAN device which utilizes cell phone signal for internet and creates a redundant power source (in case of power outage);
- Emergency response device attached to the patient on wrist, which the patient can press anywhere in their home to communicate with their virtual nurse.



### 4 KP at Home Metrics and Capabilities for Agile Care

KP at Home has a consistent ADC that is well above 12 patients daily and typically 15-20 patients daily. Our metrics mirror those of HaH programs in the literature



Some of the essential components of the KP at Home model of care that allow us to care for patients with Sepsis

CAPABILITY	NOTES
Ability to check vitals frequently	Our tech allows us to check vitals with a nursing eval every 15-30 minutes if necessary
Physician oversight	We are staffed from 7:30-10pm and have 24-hour Hospitalist coverage
Urgent paramedic visits	Paramedic within 45 min - IVF bolus - EKG - Evaluation
Transportation	Urgent transportation capability (within 45 minutes) vs. 911 transport
Escalation protocol	Detailed escalation protocols used for any change in patient clinical status

### 5 Intervention

The KP at Home team worked closely with the KPNW Regional Sepsis Workgroup to develop specific protocols for the admission and initial care of septic patients directly from the ED.

#### Sepsis Decision Support Protocol:

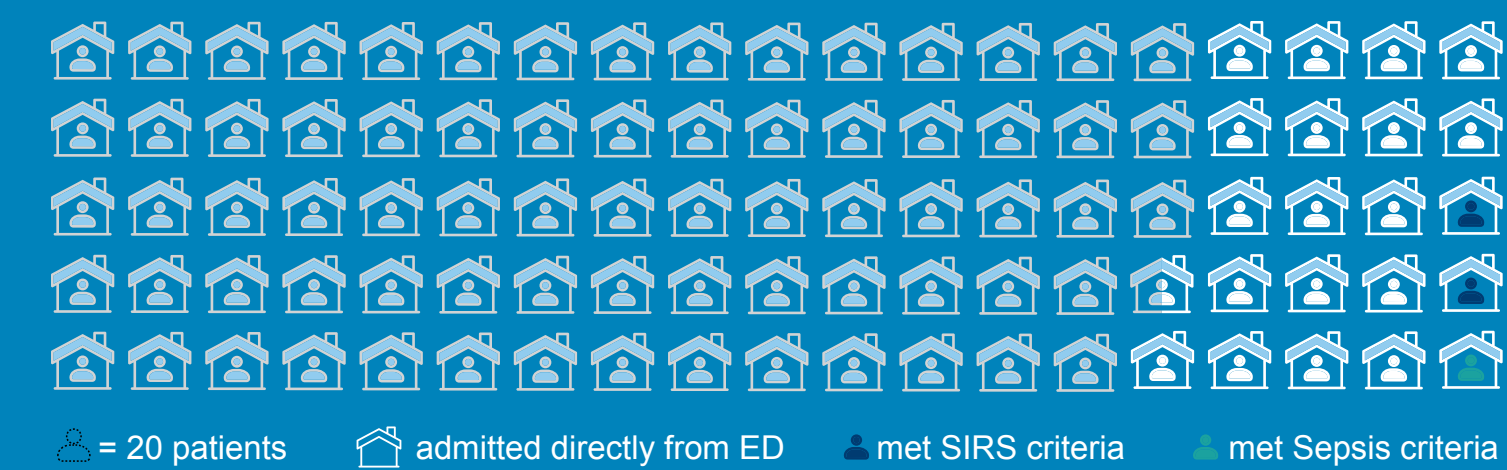
- Initial Lactate < 3 mmol/L
- Lactate clearance (E.g., Lactate improving and less than 3 mmol/L)
- Systolic BP > 90 mm Hg
- QSOFA less than 2
- Patient should not have evidence of fluid overload

#### Sepsis Oversight and Escalation Protocol:

Once a septic patient is identified and meets the above parameters, they must pass a clinical and social safety screening process. A hospitalist then does a full H&P before the patient is transported home. Once at home, a KP at Home physician evaluates them with an admission video visit and establishes parameters for vitals and nurse check frequency as well as parameters for notifying a physician due to clinical decline.

### 6 Results

Of the 1900 patients admitted to KP at Home, 428 of them were admitted directly from the ED. Of those; 40 met SIRS criteria and 20 met Sepsis criteria.



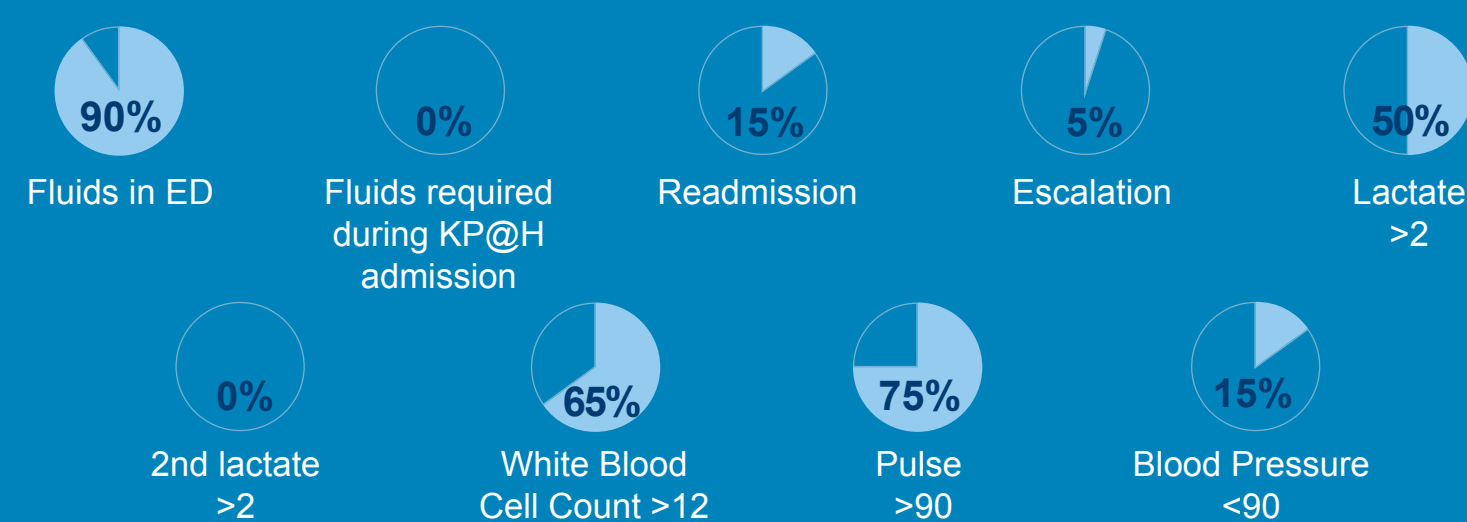
#### Initial ED Vitals and Lab values of Septic patients admitted to KP at Home

	Systolic BP	Pulse	Temperature	Respiratory rate	Pulse Oximetry	BMI	Creat	TB	PLT	WBC	Length of Stay
Mean	121.8	103.2	100.3	20.4	96.3	31.4	1	0.7	271.1	14.3	4.2
Median	122.5	105	100.5	20	95.5	29	0.9	0.6	243	12.8	4
IQR	14	9.5	2.2	4	5	11.5	0.3	0.4	119	6.5	1

This table describes ED vitals and labs prior to KP at Home admission with Sepsis

All patients admitted with sepsis fell well within the initial criteria for KP at Home admission.

#### Sepsis parameters for patients admitted with sepsis to KP at Home

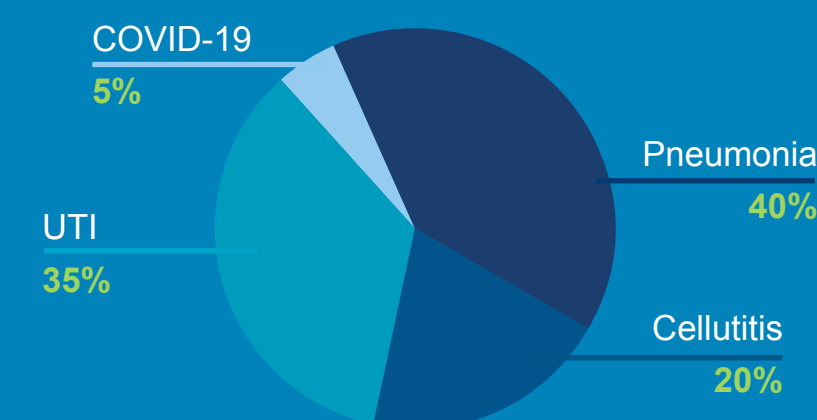


Note that 90% of patients received appropriate fluids in the ED and none required fluids during their KP at Home admission.

#### Comparison of readmission rates, escalation rates, and 30-day mortality between KP at Home patients with and without sepsis

	KPAH Sepsis N= 20	KPAH without Sepsis N = 388	2-sided p-value
Readmission percentage	15	8	0.27
Escalation percentage	5	13	0.696
30 day mortality	0	1.9	0.534

#### The etiologies of sepsis for patients admitted to KP at Home



### 7 Discussion

Of the 428 patients admitted from the ED to KP at Home and treated for hospital level illnesses 40 met SIRS criteria, and of those 40, 20 met sepsis criteria.

There were no adverse outcomes and all patients:

- Received blood cultures prior to antibiotics
- Received Antibiotics
- Received 30ml/kg fluid bolus (excluding COVID patients with sepsis)
- 0% 30 day mortality rate
- Only 1 patient was escalated – (a COVID patient with worsening respiratory status)

In comparison to KP at Home patients treated without sepsis, there were similar readmission and escalation rates.

### 8 Conclusion

With carefully constructed parameters that take into account the ability to evaluate, treat, and escalate patients, KP at Home is able to safely treat patients meeting low to intermediate risk septic criteria.

### 7 Acknowledgments

We would like to thank the KPNW Regional Sepsis Workgroup as well as Medically Home.

