

# Universal Screening is Key: Identifying Gaps in Adolescent HIV Infection Diagnosis at Local Pediatric Health System as Compared to Regional Adult Hospital

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## Abstract

**Background:** Undiagnosed sexual partners with HIV infection may contribute to up to 30% of new infections annually. Routine HIV screening of high risk populations has been shown to be effective and is recommended by the CDC. Despite this recommendation, many adolescents are not screened. The negative impact on the adolescent population from inadequate screening has not been fully quantified.

**Methods:** Through a retrospective chart review, the course prior to diagnosis of HIV-infected adolescents diagnosed at Children's Medical Center (CMC) in Dallas, TX and Parkland Hospital (PH), the proximate adult county hospital with a universal HIV screening program was reviewed. Subjects were included if they had a confirmed, positive HIV test between 13 and 21 years of age, and excluded if they had a previous HIV diagnosis. Inpatient, outpatient, and ED encounters at CMC and PH following the subjects' 13th birthday and before their HIV diagnosis were quantified. Missed opportunity encounters (MOE) were defined as above encounters where there was no HIV screen performed that took place after the date 3 months following their most recent HIV screen. Data was collated by facility and compared.

**Results:** 204 subjects met inclusion criteria: 140 (69%) male, 155 (76%) black, and 87 (43%) followed by CMC. There were 412 total encounters (2.02 per subject) out of which 284 (1.39 per subject) qualified as MOE. Seventy-two subjects had at least one MOE. At the CMC ED, there were 6.7 MOE for every new HIV adolescent diagnosis, compared to PH ED where there were 0.9 (p < 0.01). Adolescents identified through the PH ED were older (PH, 18.8 yrs vs. CMC, 16.1 yrs, p < 0.01), and had a trend towards a lower CD4 count (PH, 337 cells/m3 vs. CMC, 449 cells/m3, ns). Three adolescents were identified with AIDS (CD4 < 200) through HIV screening at PH, vs 1 at the CMC ED.

**Conclusion:** Missed opportunity encounters for HIV screening of adolescents are greater in number in pediatric emergency departments without universal screening programs, as compared to similar adult settings with such a program. Implementing a universal HIV screening protocol at pediatric EDs in HIV endemic areas may help to identify HIV-positive adolescents at younger ages and improve long term outcomes.

## Background

- Recent data have shown that despite overall national trends towards fewer new HIV diagnoses, the incidence of new HIV infections in adolescents and young adults has not decreased<sup>1</sup>.
- Early diagnosis is important in order to prevent transmission of HIV and to improve outcomes for those infected.
- The Centers for Disease Control and Prevention (CDC) recommends all adolescents should be screened for HIV. The screening should happen in any medical setting including the emergency department<sup>2</sup>.
- Despite this recommendation, most adolescents are not screened for HIV infection<sup>3</sup>, and it is not clear how much harm they incur due to inadequate screening.
- In adults, HIV diagnosis has improved through implementation of universal HIV screening programs in emergency departments, however such programs have been slow to be implemented in pediatric hospitals.
- Hypothesis: A universal screening program in pediatric settings including the emergency department would improve early diagnosis of HIV infection in adolescents.
- Purpose: Quantify the number of Missed Opportunity Encounters (MOE) for earlier diagnosis of HIV infection in adolescents at a local pediatric hospital compared to a local adult hospital.

## Methods

- Retrospective chart review
- Inclusion criteria: All individuals with a new HIV infection between ages 13y and 20y from January 2006 through March 2017 at Children's Health (CMC) and Parkland Hospital (PH)
- Exclusion criteria: Individuals outside the age range, perinatally acquired HIV, those who had no positive HIV tests recorded, and those who were previously followed and/or treated for HIV at a previous site
- Those who had the diagnostic test ordered at another location but were then primarily managed at either of the two sites were INCLUDED in the study
- Primary outcome: number of Missed Opportunity Encounters (MOE)
  - MOE = any encounter after the latter of: the subject's 13<sup>th</sup> birthday or the date 3 months after the subject's most recent negative HIV screen, and before the encounter of HIV diagnosis.
  - The 13<sup>th</sup> birthday was chosen as this is the earliest that the CDC recommends HIV screening
- Secondary outcomes: CD4+ T cell count at diagnosis, sexually transmitted infections at diagnosis

## Results

- Dallas County has the highest rates of new HIV diagnoses, AIDS diagnoses, and HIV prevalence in Texas (2016, Tx HIV Surveillance Report).

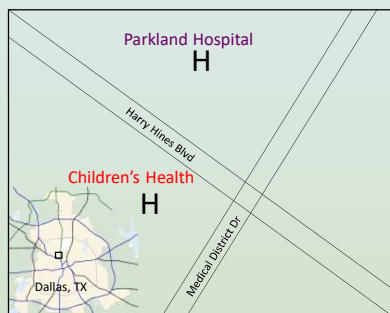


Figure 1: Diagram of relative locations of Children's Health (3.5-6K adol encounters in ED/yr) and Parkland Hospital (12.7-14.7K adol encounters in ED/yr)

- Individuals diagnosed at CMC were younger, and more likely to be male and MSM.

Location of Diagnosis	CMC (n=23)	PH (n=41)	Other (n=140)	P value
Age (mean)	16.5	18.3	17.6	p < 0.05
Sex				p < 0.05
Male	20 (87.0%)	22 (53.7%)	98 (70.0%)	
Female	3 (13.0%)	19 (46.3%)	42 (30.0%)	
Race				p = 0.61
Black	19 (82.6%)	32 (78.0%)	104 (74.3%)	
White	4 (17.4%)	9 (22.0%)	31 (22.1%)	
Unknown	0	0	5 (3.6%)	
Ethnicity				p = 0.18
Hispanic	1 (4.4%)	5 (12.2%)	23 (16.4%)	
Non-Hispanic	22 (95.6%)	36 (87.8%)	110 (78.6%)	
Unknown	0	0	7 (5.0%)	
Reported History of Sexual Activity				p = 0.055
Yes	7 (30.4%)	13 (31.7%)	23 (16.4%)	
No	16 (69.6%)	28 (68.3%)	117 (83.6%)	
MSM				p < 0.05
Yes	16 (69.6%)	14 (34.2%)	83 (59.3%)	
No	4 (17.4%)	4 (9.8%)	11 (7.9%)	
Unknown	0	4 (9.8%)	4 (2.9%)	
Pregnant				p = 0.084
Yes	0	6 (14.6%)	10 (7.1%)	
No	3 (100%)	13 (31.7%)	32 (22.9%)	

Table 1: Patient demographics based on location of diagnosis

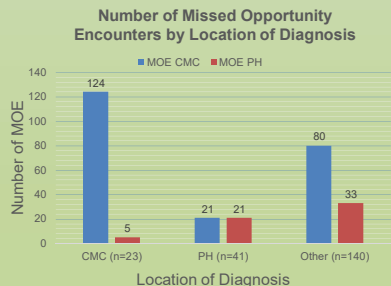


Figure 4: Sites of 284 missed opportunity encounters stratified by locations that those subjects were diagnosed with HIV infection

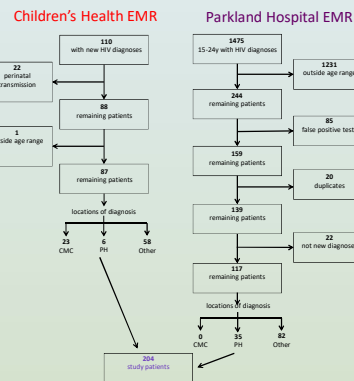


Figure 2: Flow diagram of study inclusion. The sites listed at the top are the sites where the data was obtained, not where the subjects were diagnosed or treated

### Missed Opportunity Encounters by Site

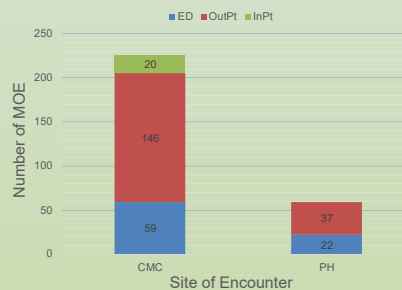


Figure 3: The sites of the 284 missed opportunity encounters

### Missed Opportunity Encounters vs. Diagnoses by Location

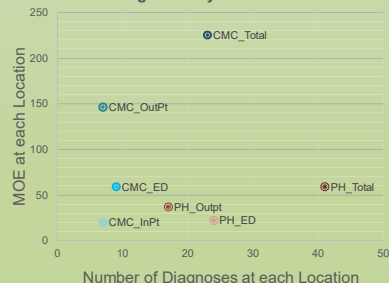


Figure 5: Comparing number of missed opportunity encounters at each location to the number of HIV diagnoses at each location

## Results

- 13 individuals presented with AIDS (CD4 < 200) at the time of HIV diagnosis, with MOE in these subjects almost exclusively at CMC

AIDS Patient	Age	Sex	MSM	CD4	MOE	Location Dx
1	17	M	Y	6	0	CMC ED
2	15	M	N	49	0	CMC Inpt
3	19	M	Y	10	2 (2 CMC)	PH ED
4	15	F	N/A	30	4 (4 CMC)	PH ED
5	19	M	Y	142	0	PH ED
6	20	M	Y	182	0	PH Inpatient
7	17	M	N	1	0	Other (Outside Clinic, medical home)
8	18	F	N/A	10	0	Other (Unknown)
9	17	M	Y	45	3 (3 CMC)	Other (Outside hospital)
10	17	M	Y	77	3 (2 CMC, 1 PH)	Other (College screening)
11	17	F	N/A	138	0	Other (Unknown)
12	16	M	Y	155	0	Other (Outside Clinic, medical home)
13	19	M	Unknown	161	0	Other (Outside hospital)

Table 2: Demographics of 13 subjects presenting with AIDS (CD4 count <= 200) at time of HIV diagnosis

## Conclusion

- MOE occur frequently in adolescents eventually diagnosed with HIV infection
- CMC (a pediatric hospital without universal screening) had more MOE in HIV diagnosed adolescents, than PH (an adult hospital with universal screening)
  - This may be partially explained by the younger ages of the individuals having more total visits to the pediatric facility
- However, many subjects with MOE at CMC would go on to be diagnosed with HIV at PH or other sites
- In addition, PH has a far lower MOE to HIV Diagnoses ratio than CMC
- Universal screening for HIV infection may be an effective way to increase diagnoses and decrease MOE at a pediatric hospital

## Future Directions

- Implementation of a universal HIV screening protocol in the CMC emergency department may decrease the number of MOE, and decrease the number of undiagnosed adolescents in Dallas County.
  - Rapid HIV testing may be the preferred method in the ER setting.
- A QI program which prospectively tracks data including: number of total HIV tests ordered, number of positive HIV screens, confirmed HIV diagnoses, and the number of MOE of newly diagnosed HIV adolescents may be helpful in guiding screening programs at free standing children's hospitals.

## References

1-O'Brien MCB, Dunville R, Zhang T, Barrios LC, Oster AM. HIV Diagnoses Among Persons Aged 13-29 Years - United States, 2010-2014. MMWR Morbidity and mortality weekly report 2018;67:212-5.  
 2-Branon RH, Handfield ML, Lange MA, et al. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. MMWR Recommendations and reports: Morbidity and mortality weekly report Recommendations and reports 2006;55:1-17, quiz CE1-4.  
 3-Van Handel M, Klein L, Olson KD, Dietz P. HIV Testing Among US High School Students and Young Adults. Pediatrics 2016;137:20152700.