Mount Sinai Health System HIV Care Cascade for Established Patients (2016)

Percentage of Patients

Open Patients

(All HIV+ pts w/any visit to MSHS in 2016)
Data Source: Epic/EPSi

	MSH	MSBI	MSSL	MSW	MSQ	MSB	Total
	n=6995	n=4393	n=1773	n=4210	n=71	n=376	n=15719

Active Patients

(Open pts w/visit to MSHS HIV program in 2016)
Data Source: Epic/EPSi

	MSH	MSBI	MSSL	MSW	MSQ	MSB	Total
	n=5518	n=2330	n=1601	n=3910	n=10	n=161	n=11634

Prescription of ART

(Active pts w/ART prescription in 2016)
Data Source: Epic

	MSH	MSBI	MSSL	MSW	MSQ	MSB	Total
	n=4985	n=1953	n=1525	n=3712	n=9	n=147	n=10573

Viral Load Suppression

(Active pts w/VL <= 200 at last test in 2016)
Data Source: Epic

	MSH	MSBI	MSSL	MSW	MSQ	MSB	Total
	n=4520	n=1842	n=1247	n=3278	n=7	n=131	n=9396

Definitions

MSH: Mount Sinai Hospital
MSBI: Mount Sinai Beth Israel
MSSL: Mount Sinai St. Luke's
MSW: Mount Sinai West
MSQ: Mount Sinai Queens
MSB: Mount Sinai Brooklyn
Total: MSHS (Mount Sinai Health System), deduplicated

IAM: Institute for Advanced Medicine
AHC: Adolescent Health Center
FPA: Faculty Practice Associates (ID Clinics)

**Note: the IAM and FPA portions of each hospital include ALL six IAM and three FPA practices, not only those associated with the given hospital. Patients remain within their hospital bar throughout the cascade, and are deduplicated within the hospital, though one patient may appear in multiple hospitals if they had visits to more than one facility in 2016.*

See methodology and QI plan for more information.

Mount Sinai Health System HIV Care Cascade for Newly Diagnosed Patients (2016)

Percentage of Patients

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%

MSH MSBI MSSL MSW MSQ MSB Total

Newly Diagnosed Patients

(Pts newly diagnosed with HIV in 2016 within MSHS)

n=139 n=24 n=35 n=21 n=7 n=4 n=213

Linkage to Care

(Newly dx'd pts w/HIV care appt internally in 3 days or externally in 5 days)

38% 25% 74% 76% 0% 100% 46%

n=53 n=6 n=26 n=16 n=0 n=4 n=99

Prescription of ART

(Newly dx'd pts w/ART prescription documented in 2016)

60% 46% 66% 76% 71% 75% 60%

n=83 n=11 n=23 n=16 n=5 n=3 n=128

Viral Load Suppression

(Newly dx'd pts w/VL <=200 copies/mL at last test in 2016)

55% 54% 54% 71% 14% 75% 54%

n=77 n=13 n=19 n=15 n=1 n=3 n=115

Suppressed w/in 6 & 12 Mo. of Diagnosis

(Newly dx'd pts virally suppressed w/in 6 or 12 months of diagnosis)

65% 12 Mo 65%
6 Mo 58%
71% 12 Mo 71%
6 Mo 67%
60% 12 Mo 60%
6 Mo 54%
71%
6/12 Mo 71%
29%
6/12 Mo 29%
100%
6/12 Mo 100%
64% 12 Mo 64%
6 Mo 58%

n=91 n=17 n=21 n=15 n=2 n=4 n=136

Definitions

MSH: Mount Sinai Hospital
MSBI: Mount Sinai Beth Israel
MSSL: Mount Sinai St. Luke's
MSW: Mount Sinai West
MSQ: Mount Sinai Queens
MSB: Mount Sinai Brooklyn
Total: MSHS (Mount Sinai Health System), deduplicated

Data Source: Epic EMR

**Note: Patients remain within their hospital bar throughout the cascade, and are deduplicated within the hospital, though one patient may appear in multiple hospitals if they had visits to more than one facility in 2016.*

See methodology and QI plan for more information.

HIV Treatment Cascade Methodology

Mount Sinai Health System, 2016

Both the cascades for Newly Diagnosed Patients and for Established Patients were developed by Rebecca Lindner, the Analyst for Quality Improvement for the Institute for Advanced Medicine (IAM). Data was extracted using Access/SQL, analyzed using a combination of Python and R, and visualizations created in R.

Data Sources

Data was extracted from Epic, the EMR used by most clinics within the Mount Sinai Health System (MSHS), and supplemented by data from EPSi, a tool tracking visit-level financial data for Mount Sinai Beth Israel and Mount Sinai Brooklyn. These two systems contain the majority of patients seen in 2016 at the six hospitals within the Health System: Mount Sinai Hospital (MSH), Mount Sinai Beth Israel (MSBI), Mount Sinai St. Luke's (MSSL), Mount Sinai West (MSW), Mount Sinai Queens (MSQ), and Mount Sinai Brooklyn (MSB). All patients with a diagnosis of HIV/AIDS with a visit anywhere in MSHS were pulled, as well as a list of every completed visit by these patients.

Patient-level Epic data was pulled using the system patient ID, which is anonymized and not linked to PHI, in accordance with Data Manager and Analyst contracts for the Institute for Advanced Medicine (IAM). As there was no shared patient identifier between EPSi and Epic, EPSi data was matched to Epic data to avoid duplication using a two-step algorithm written in Python. In the first step, any patients matching exactly on date of birth, first name, and last name between the two systems were linked and given the Epic system patient ID. For the remaining patients not meeting these exact match criteria, patients were matched on date of birth and a fuzzy string search was performed on first and last names using Levenshtein distance (a measure of difference between two sequences of characters which gives their similarity based on the number of edits that would be required to match them exactly). Fuzzy string searching was performed as there may be some name irregularities between systems; for instance, EPSi might have a hyphen in the last name and Epic may not, or there may be small typos in one or both records. Any match with a ranking below 75% similarity was discarded, as anything below this threshold is extremely unlikely to be a name match, and the remaining possibilities were manually checked. A new anonymized ID was generated for the patients not matching from EPSi to Epic, which created a single list of all HIV+ patients who touched MSHS in 2016 and a single list of all of their visits at any clinic for any reason.

One major limitation of this strategy is that there are some parts of MSHS that are not on Epic or EPSi, particularly at MSQ or on the inpatient side of MSH. Data analysts and managers at IAM do not have access to these other systems. However, the vast majority of MSHS clinics had moved to Epic by the beginning of 2016, and the addition of EPSi data captured nearly all HIV+ patients touching the system.

Newly Diagnosed Patients

The patient cohort for the newly diagnosed cascade was determined as the data pull included both established and new patients. First, all patients with positive confirmatory HIV testing recorded in Epic in 2016 were pulled. From this group (798 patients), any persons with HIV-related lab work (viral load or CD4 testing), ART prescriptions (excluding nPEP and PrEP medications), or diagnoses in the problem list or medical history prior to 2016 were removed, along with any false positives, leaving 380 patients who were potentially newly diagnosed in 2016. Of these, 276 were seen within IAM clinics, and could therefore be chart reviewed for a conclusive determination of diagnosis date. 150 of these 276 were found to have a diagnosis date in 2016. The remaining 104 patients could not be chart reviewed under IAM Data Analyst and Manager contracts. An algorithm was created to determine the most likely diagnosis date of these patients, primarily by examining whether historical ART regimens were documented at the confirmatory testing visit, and 63 were found to be newly diagnosed in 2016. The date of testing, rather than the result date, was used as the diagnosis date in determining linkage to care, and linkage occurred nearly entirely internally. Two patients were documented as referred externally, but were not linked within 5 days of diagnosis. The remaining newly diagnosed patients were linked to care internally, and any visit with a provider with ART prescribing privileges was considered to be the first visit date for the linkage to care metric.

There were several unavoidable limitations on this analysis, the most significant of which is the lack of uniformity in documentation around HIV diagnoses in the EMR. While some providers put the diagnosis date in the problem list or medical history, most do not, leaving no extractable way to determine date of HIV diagnosis for the majority of patients. While confirmatory testing is a good proxy, it is not a perfect system, hence the algorithmic implementation described above. For those patients not chart reviewed, there is no way to be entirely certain that they were newly diagnosed in 2016, simply that it is more likely they were newly diagnosed than not at their confirmatory testing.

Open and Active Caseloads

Removing all newly diagnosed patients from the patient panel developed from Epic and EPSi data in the process described above created a system-wide open caseload for MSHS. Using all of the visits completed by this cohort, code was written in R to subset the patients by site and de-duplicate each list. All clinics were coded to their matching hospital, creating six groups of patients. These groupings were not mutually exclusive – while there was no duplication within each hospital subset or within the overall panel, patients could fall into two or more buckets if they had visits at multiple facilities in 2016.

Due to current documentation practices, the only group of inactive patients that could be identified from this open panel was those who were deceased. Deceased patients were identified by documented patient status in Epic as well as diagnosis codes; while incarceration and care at outside organizations are not entered into Epic or EPSi in any extractable way. Table 1 provides a summary of open and active patients, with inactive patients subdivided into those of unknown disposition and those deceased.

Hospital	Open	Deceased	Incarcerated[1]	Engaged in Outside Care[2]	Unknown Disposition	Active
MSH	6995	41	0	0	1436	5518
MSBI	4393	7	0	0	2056	2330
MSSL	1773	5	0	0	167	1601
MSW	4210	11	0	0	289	3910
MSQ	71	0	0	0	61	10
MSB	376	2	0	0	213	161
Total (MSHS)	15719	60	0	0	4025	11634

Table 1: Established Patient Disposition

After removing known deceased patients, active patients were differentiated by code demarcating all visits to HIV care programs, including the six IAM clinics at MSH (Jack Martin, Downtown), MSBI (Peter Krueger), MSSL (Morningside), and MSW (Samuels, Spencer Cox), three separate FPA HIV practices at MSH, MSBI, and MSB, and the Adolescent Health Center (AHC) at MSH. Patients in any hospital bar could have a visit at any IAM, AHC, or FPA clinic in order to fall into that hospital bar's group for IAM, AHC, or FPA, respectively. For instance, if a patient seen at the Cancer Center at MSH received ongoing HIV care at the IAM's Morningside clinic at MSSL hospital, they would be counted in both the MSH hospital bar (due to Cancer Center visits) and the MSSL hospital bar (due to Morningside clinic visits), and they would be part of the IAM portion of those bars in both hospitals.

In order to create the breakdown by HIV care practice in the cascades, patients with visits at IAM clinics were first pulled into the active group. Then, any open patients without visits to IAM clinics were checked for visits to AHC. Finally, the patients remaining in the open group were checked for visits to FPA clinics. This tiered approach ensured that there was no duplication in creating the full active panel for each hospital, as many patients were seen at more than one type of HIV care program. An attempt was made to subset patients by individual IAM clinic, but too much overlap was present in the groups and there was no clear way to prioritize the clinics for a similar tiered approach.

ART Prescriptions and Viral Load Suppression

Data on prescription of ART and viral load suppression was pulled from Epic for all newly diagnosed patients and for active established patients. Raw data was aggregated using Access/SQL, and was cleaned using R scripts. Any patient who was prescribed ART during calendar year 2016 was counted for the ART portion of the cascade, and any patient who had a viral load under 200 copies/mL[3] at their last test in 2016 was counted for the VL suppression portion.

In looking at the data for VL suppression among newly diagnosed patients, it was clear that this did not provide an accurate measurement for those patients who were diagnosed toward to the end of

[1] As noted above, incarceration could not be extracted from available data systems. The zeroes do not mean that none of our patients are incarcerated, simply that no information on incarceration is recorded in an extractable manner in the EMR.

[2] See footnote 1, also applicable to engagement in care at outside organizations.

year. Therefore, we decided to include an additional chart showing if these patients achieved viral load suppression within 6 and 12 months of their diagnosis. This is consistent with measures on the ETE dashboard.

Persons Responsible

Data was extracted from Epic by Rebecca Lindner, the Analyst for Quality Improvement for IAM, and from EPSi by Charlene Monaco, the Data Manager at MSBI's Peter Krueger Clinic. All data was compiled and analyzed by Rebecca Lindner, along with writing all algorithms in Python and R. The cascade charts, presentation, and methodology were also created by Rebecca Lindner with the help and input of Vince Mojica, the Director of Data Management for IAM, and Shruti Ramachandran, the Director of Quality Improvement for IAM.