Preventive Medicine Reports 40 (2024) 102672

Contents lists available at ScienceDirect

Preventive Medicine Reports

journal homepage: www.elsevier.com/locate/pmedr

A retrospective review of the rate of sexually transmitted infections in adolescents after universal screening protocol implementation in an urban United States clinic

Anthony Tirone[a,*,1], Laura Maule[a,1], Jessie Huang[a], Jenna Higgins[b], Tanner Walsh[b], Domenic Filingeri[c], Alyssa Songveera[d], Christina Poh[e], Ashley N. Henderson[b]

[a] Drexel University College of Medicine, 60 N 36th Street, Philadelphia, PA 19104, USA
[b] Department of Pediatrics, Drexel University College of Medicine and Crozer Health, 30 Medical Center Boulevard POB1 Suite 205, Upland, PA 19013, USA
[c] Department of Pediatric Endocrinology, UPMC Children's Hospital of Pittsburgh, 4401 Penn Ave., Pittsburgh, PA, USA
[d] Department of Pediatrics, Stanford University School of Medicine, 750 Welch Road, Suite 220, Palo Alto, CA 94304, USA
[e] Meritus Medical Center, 11110 Medical Campus Rd, Hagerstown, MD 21742, USA

ARTICLE INFO

Keywords:
Adolescent health
STI screening
STD screening
Gonorrhea
Chlamydia

ABSTRACT

Objective: Despite expanded guidelines, adolescent gonorrhea and chlamydia (GC/CT) screening rates remain low due to multiple psychosocial barriers and biases. This intervention aimed to improve screening and diagnosis rates at adolescent well visits by establishing a streamlined universal screening protocol for all patients ages 13–18 years old.
Methods: A universal sexually transmitted infection (STI) screening approach was introduced at an urban clinic affiliated with an academic medical center near Philadelphia, Pennsylvania (PA) in September 2018 for all adolescent well-visits. GC/CT screening and diagnosis rates were compared two years prior to and two years after implementation, deemed the baseline and intervention groups, respectively.
Results: In total, 1,168 encounters were included for analysis. The patient cohort consisted of 47% females, with an average age of 15, and were predominantly publicly insured (79%). STI screening rates increased significantly from 16.7% (89/534) to 83.6% (530/634) of adolescents with implementation of the universal screening protocol. Furthermore, there was a 1.6-fold increase in total positive cases detected after implementation of ok universal screening.
Conclusion: This study demonstrates improved adolescent GC/CT capture rates by establishing a universal screening protocol and highlights a streamlined means of implementation in virtually any pediatric clinic. Limitations include sample size, as this is a single academic practice, as well as any issues with lab collection and results reporting.

1. Introduction

Adolescents make up over a quarter of the sexually active population. According to the Centers for Disease Control (CDC), adolescents account for over half of new STIs annually in the United States (Bowen et al., 2019; Kreisel et al., 2021; Shannon and Klausner, 2018). The two most reported STIs in the United States, *Chlamydia trachomatis* and *Neisseria gonorrhoeae*, similarly have their highest prevalence in adolescents and young adults (Tomcho et al., 2021; Vermund et al., 2021). Studies have shown that between 2014 and 2018 there was a 19 % increase in chlamydia and a 63 % increase in gonorrhea infections in the United States despite updated screening guidelines and interventions aimed at detecting disease and preventing transmission (Bowen et al., 2019).

Many STIs including chlamydia and gonorrhea are asymptomatic but can result in significant morbidities including, but not limited to, pelvic

Abbreviations: GC/CT, Gonorrhea and Chlamydia; STI, Sexually Transmitted Infection; CHMG, Crozer Health Medical Group; USPSTF, US Preventive Service Task Force.

* Corresponding author at: 1132 Vivjon Drive, West Homestead, PA 15120, USA.
E-mail address: amt444@drexel.edu (A. Tirone).

[1] These authors contributed equally to this work.

https://doi.org/10.1016/j.pmedr.2024.102672
Received 15 September 2023; Received in revised form 26 February 2024; Accepted 27 February 2024
Available online 29 February 2024

inflammatory disease (PID), ectopic pregnancy, urethritis, and infertility (Workowski et al., 2021; Bender et al., 2011). This has led several national organizations including the United States Preventive Service Task Force (USPSTF) (LeFevre, 2014), the American Academy of Pediatrics (AAP) (Murray et al., 2014), and the CDC (Workowski et al., 2021), to release guidelines recommending screening for sexually active females below age 25. The AAP also extended these screening recommendations to include high-risk adolescent male populations (i.e., males who have sex with males) (Murray et al., 2014). Despite these national guidelines, the majority of adolescents are not being screened for STIs (Chlamydia screening among females, 2023; Fiscus et al., 2004).

Addressing barriers to comprehensive STI screenings in the adolescent population is a well-studied, multi-factorial issue (Bender and Fulbright, 2013; Arrington-Sanders et al., 2020; Chin et al., 2012). Studies have indicated discrepancies in STI screening when race and insurance status are factored in, suggesting clinician bias when assessing risky sexual behavior (Fiscus et al., 2004; Henry-Reid et al., 2010; Wiehe et al., 2011; Cook et al., 2001). Additional barriers to STI screening have been documented in the literature, including cost, access to transportation, wait times, conflicting clinic and work or school hours, stigma, and confidentiality (Workowski et al., 2021; Cook et al., 2001). Compounding patient barriers to STI screening, it has been shown that risk for infection is not adequately assessed by healthcare personnel. In one study, less than a quarter of adolescent patients were even asked about their sexual history, and only about 2 % were tested for STIs (LeFevre, 2014). Another study found over 7 % of patients who were documented as "not sexually active" actually tested positive for chlamydia or gonorrhea infections (Tomcho et al., 2021). Thus, there is a demonstrable need to broaden STI screening criteria amongst adolescents to reduce potential bias and number of missed cases.

A limited number of studies have evaluated the validity of universal STI screening models, with some showing favorable outcomes (Buzi et al., 2016; Allison et al., 2021; Cole et al., 2014; Allison et al., 2022; Tomcho et al., 2022). One study looking at universal STI screening for detainees at Cook County Women's Jail demonstrated both higher screening rates and treated cases of venereal disease in the community (Cole et al., 2014). Another study in Denver, Colorado found that screening rates among adolescents ages 14–18 could be increased by 25.2 % and 11.8 % in pediatric and family medicine settings, respectively (Tomcho et al., 2021). While these studies have shown encouraging results on screening rates, fewer evaluations exist that assess the effect of a universal STI screening approach specifically on disease detection. Allison et al. found that an universal screening approach increased both percent screened as well as the absolute number of cases detected, though the positivity rate remained the same in the baseline and intervention groups (Allison et al., 2022). A more recent study by Tomcho et. al demonstrated that universal testing increased both screening rate (an absolute increase of 14.2 %) as well as detection of STIs (Tomcho et al., 2022).

The adolescent population in Delaware County, PA, is similar to many other urban adolescent populations. They face many healthcare barriers as well as more than double the rates of chlamydia and gonorrhea when compared to neighboring counties, with rates rising annually (Pennsylvania Department of Health, 2020; Pinto et al., 2018). Prior to September 2018, adolescent chlamydia and gonorrhea screening at the Crozer Health Medical Group (CHMG) pediatric office, Crozer Pediatrics, was offered as part of an "opt-in" protocol for patients based on risk stratification and patient request. In September 2018, the clinic adopted a universal chlamydia and gonorrhea screening protocol for adolescents presenting to the clinic for well child visits regardless of their reported sexual activity. This retrospective study aims to assess whether universal STI screening protocol at well visits for all adolescents aged 13–18 years, regardless of sexual history or gender, results in increased screening rates and increased detection of gonorrhea and chlamydia.

2. Methods

2.1. Setting

The intervention was implemented at Crozer Pediatrics office in September 2018. The office is an academic, urban, primary care clinic that serves Delaware County, PA. During the study period, the clinic was staffed by 18 resident physicians who worked under 6 attending physicians. The residents provided patient care and conducted well child visits independently, with supervision from the attending physicians. Over three-quarters of patients served by this clinic use Medicaid. Baseline data was evaluated from August 31, 2016 to the intervention start (September 1, 2018), and intervention data was evaluated from September 1, 2018, through November 30, 2020. The intervention period was slightly longer than the baseline period due to the decline in visits from March through June 2020 during the statewide lockdown related to COVID-19. We extended the intervention period to ensure comparable numbers of patients in both groups.

2.2. Intervention

The universal testing intervention included adolescents aged 13 to 18 years old at the time of the encounter presenting for well child visits. The intervention began with a transition to the universal screening protocol in late August 2018 with all well child visits at the pediatric clinic utilizing the universal screening protocol by September 2018 (Fig. 1). Upon check-in, all adolescent patients ages 13–18 were provided an AAP Bright Futures Adolescent Screening Questionnaire (Bright Futures Adolescence Tools, 2023) in addition to an information sheet that described confidential care and universal STI screening. On the questionnaire, patients were asked about sexual activity and concerns about STIs as well as other adolescent-specific topics. The questionnaire was mainly used as a guide to stimulate conversation between the provider, the adolescent, and the parent or guardian.

During the rooming process after check-in, medical assistants would collect all adolescent patients' height, weight, and vitals. During this time, a confidential phone number was verified with the patient, the universal screening protocol was explained using standard language, and a urine sample was obtained. Adolescents were explained the importance of STI screening and given the opportunity to opt-out if they desired to. Contact information was documented in the confidential section of patient demographics in the electronic health record (EHR) using the standard documentation template for adolescents. The provider then completed the visit as per normal routine, including confidential portions. During this time, STI screening was further discussed and additional patient questions were answered. All portions of the well-child visit including confidential information, laboratory tests, and medications were documented and ordered in the electronic health record. Visits were conducted in English or otherwise in the patient's preferred language via bilingual providers or licensed medical interpreters.

2.3. Data collection & statistical analysis

The intervention was evaluated using a controlled pre-post quasi-experimental design. Data from August 31, 2016 to November 30, 2020 was manually extracted from the EHR utilizing filters for inclusion criteria. These filters included ICD-10 codes for well child encounters, the age range 13–18, and the dates consistent with the study period listed above. The extracted data included demographics (age, sex, insurance type, zip code), encounters, and laboratory test results. If patients had multiple encounters during the study period, all visits were included. Sex was defined as the sex assigned at birth.

The primary outcome measure was the proportion of encounters in which the patient had chlamydia and gonorrhea testing completed at the encounter date. Secondary outcome measures included (1) the

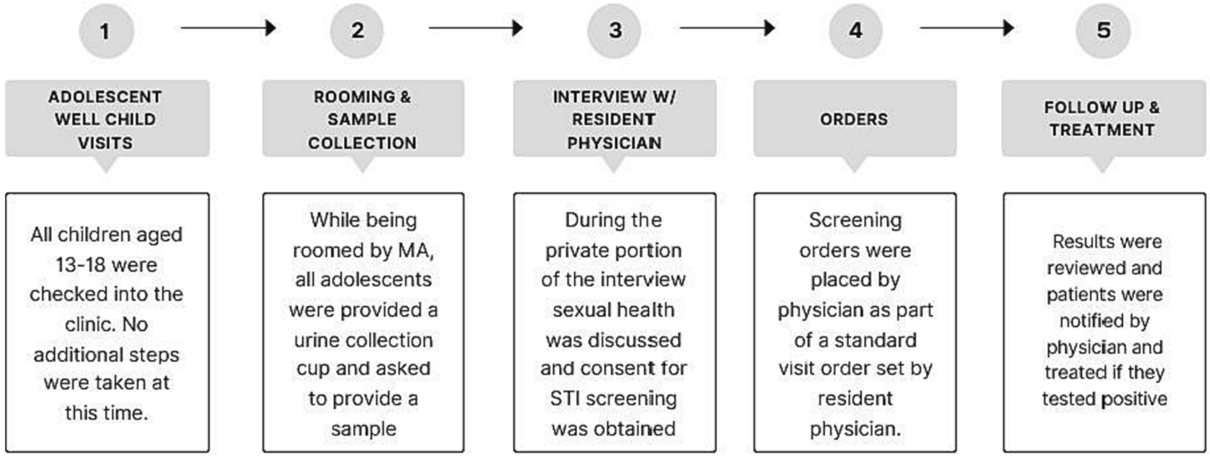

Fig. 1. Universal GC/CT screening workflow fully adopted by the Crozer Pediatrics office in Pennsylvania, USA in September 2018 to screen adolescents ages 13–18 for GC/CT.

percentage of chlamydia and gonorrhea tests that were positive for chlamydia or gonorrhea and (2) differences in the distribution of age, sex, insurance status, and zip code between pre- and post-implementation groups. Only chlamydia and gonorrhea tests utilizing nucleic acid amplification testing were included.

The statistical analysis was conducted in Microsoft Excel and tables and figures were generated using Microsoft Excel and Microsoft Word. Pearson's chi-square test was used to compare the rates of screening pre- and post-implementation and to estimate the differences in secondary outcome measures between baseline and intervention groups. The differences in the distribution of zip codes, age, sex, and health insurance of patients who underwent STI testing before and after implementation of the opt-out strategy was compared using Levene's Test for nonparametric values (A new nonparametric Levene test for equal variances, 2023). Prevalence of GC/CT positive tests was calculated by determining the number of positive tests in both the opt-out and opt-in groups per 1,000 tests administered.

The project was reviewed by the Institutional Review Board of Crozer Health (Chester, PA) and determined to be Category 5 research.

3. Results

3.1. Characteristics of adolescents presenting for care

Overall, there were 534 encounters in the baseline group and 634 encounters in the intervention group. The baseline demographic characteristics of patients included in the study are presented in Table 1. There was minimal variation in demographic data between the baseline and intervention groups, including age, sex, and zip codes. While mean age in the baseline and intervention groups differed by less than one year, the intervention group was significantly ($p < 0.05$) lower than the intervention group (14.8 and 15.0, respectively). Demographic variation remained minimal when assessing solely patients who received STI screening in both the baseline and intervention group. Age of the screened patients was significantly lower ($p < 0.001$) in the baseline than the intervention group (16.0 and 15.0, respectively).

3.2. Chlamydia and gonorrhea screening rates

Like the complete sample, adolescents in the baseline and intervention groups who were screened did not demonstrate significant differences in demographics including age, sex, and zip code (Table 1). The number of chlamydia and gonorrhea tests ordered by study phase are

Table 1
Demographics of patients divided into Overall (n = 1,168) and Screened (n = 619) groups from patients ages 13–18 presenting for well-child visits between August 31, 2016, and November 30, 2020, at Crozer Pediatrics, in Upland, PA, USA.

		Overall Demographics			Screened Demographics		
		Baseline (n = 534)	Intervention (n = 634)	*p*	Baseline (n = 89)	Intervention (n = 530)	*p*
Age, mean (SD)		14.77 (1.49)	14.96 (1.52)	0.03	15.9 (1.49)	14.98 (1.53)	<0.001
Sex, n (%)	Female	249 (46.6)	295 (46.5)	0.96	34 (38.2)	252 (47.6)	0.2098
	Male	285 (53.4)	337 (53.2)		55 (61.8)	276 (52.1)	
	Other	0 (0)	2 (0.32)		0 (0)	2 (0.38)	
Insurance, n (%)	Private	106 (19.9)	122 (19.2)	0.64	19 (21)	105 (20)	0.053
	Medicaid	414 (77.5)	504 (79.5)		68 (76)	419 (79)	
	Uninsured	14 (2.6)	8 (1.2)		2 (2)	6 (1)	
Zip code, n (%)	19,013	275 (51.5)	318 (50.2)	0.92	58 (65.2)	259 (48.9)	0.06
	19,015	73 (13.7)	86 (13.6)		6 (6.74)	75 (14.2)	
	19,061	137 (12)	73 (11.5)		9 (10.1)	63 (11.9)	
	Other	279 (22.8)	157 (24.8)		16 (18)	133 (25.1)	

*p-values represent variation between baseline and intervention groups, as calculated by chi-squared analysis.

shown in Table 2. All individuals who underwent initial urine screening were determined to have been "tested" within the study, following the intention to treat model. Testing rates increased from 16.7 % (89/534) in the baseline group to 83.6 % (530/634) in the intervention group (Fig. 2). This represents a significant 5-fold increase in testing rates with adoption of the universal screening protocol ($p < 0.001$).

Universal screening also decreased opt-out rates from 83.3 % (445/534) in the baseline group to 16.4 % (104/634) in the post intervention group. Reasons for opting out were not consistently recorded in EHR and are therefore not included in this analysis.

3.3. Chlamydia and gonorrhea infections

There was a greater absolute number of detected cases of chlamydia (12 of 534 vs. 22 of 634) and gonorrhea (1 of 534 vs. 2 of 634) between baseline and implementation for all eligible adolescents. The proportion of cases was similarly increased for chlamydia (2.22 % vs. 3.47 %) and gonorrhea (0.18 % vs. 0.32 %) between groups. (Fig. 3). Thus, we observed a 1.6 times higher overall GC/CT positivity rate in the post-intervention group compared to baseline (Fig. 2).

These results were further utilized to calculate population prevalence of GC/CT in the sample population, which we assume to be representative of the local community. In the baseline group the population prevalence per 1000 was 24/1000. In the intervention group the population prevalence increased to 38/1000.

Of note, results from 2 screened patients in the intervention group did not populate the EHR. These patients' results were addressed in real-time by the physicians and are counted as "negative" in analysis.

4. Discussion

We adopted a universal protocol to screen adolescents ages 13–18 during well-child visits with the primary goal of increasing screening rates, under the assumption that higher screening rates will allow for the detection of more cases of gonorrhea and chlamydia in the target population. Our intervention achieved a 67 % absolute increase in screening. Our study demonstrates successful implementation of universal screening in an urban, academic setting. The main secondary outcome was to assess the detection rates of chlamydia and gonorrhea in the baseline and intervention group. The increase in screening post-intervention allowed for the detection of 1.6 times the number of positive cases of gonorrhea and chlamydia. The increase in positive cases is likely a direct result of increased screening in the intervention group. Additionally, we found that demographic factors such as zip code, gender, sex, and insurance did not significantly differ between baseline and intervention groups, both in terms of screening and in positivity. This may be solely a product of the homogeneity between the sample groups and may not speak on the ability of a universal screening protocol to decrease bias in screening. If screening bias was present in the baseline group, we would have expected a significant decrease in variance after the intervention which was not the case. Further studies that focus more directly on demographics may be beneficial to determine if universal testing truly can decrease screening bias.

Our findings correspond with findings from similar studies, specifically, Allison et al and Tomcho et al. (Allison et al., 2022; Tomcho et al., 2022) who also noted significant increases in testing with the implementation of universal screening, with absolute increases of 38 % and 14 % absolute increases respectively. Our study achieved a larger absolute increase in screening comparatively; however, prior studies (Allison et al., 2022; Tomcho et al., 2022) began with higher percentages of baseline screening prior to their interventions. Our intervention was designed to be simple and easily reproducible in different clinical settings. Because the intervention took place in an academic setting with minimal resources, it was vital that steps be taken to ensure the protocol was straightforward and sustainable. Our results suggest that even a simple method of intervention can confer a significant increase in testing rates.

Further data analysis focused on establishing a more accurate picture of GC/CT prevalence in the community. The estimated prevalence per-thousand of STIs in the local adolescent community increased from 24/1000 in the baseline group to 38/1000 in the intervention group. This compares directly with the prevalence findings in similar studies including Tomcho et al. (2021) (25/1000 baseline and 41/1000 intervention) (Tomcho et al., 2021). As the percentage of tested patients increases, the prevalence of positive cases in the sample population will approach the actual percentage of positive cases in the community. Therefore, the consistent increase in positive cases in multiple intervention models suggests current protocols for STI screening insufficiently address actual STI prevalence. This can be quantified by reviewing local epidemiologic data on STI prevalence. Relative to the GC/CT prevalence of 38/1000 for adolescents under 18 demonstrated by our study, the local Department of Health estimates the prevalence of GC/CT in all individuals under the age of 25 during the same period to be 26/1000 (Pennsylvania Department of Health, 2020). Expanded STI screening may benefit not only patients who test positive but can also serve as a more accurate source of public health data compared to what is currently available.

Overall, other studies that focus on universal STI screening differ in setting, baseline screening rates, logistics, population, size, and length. In contrast to other universal screening models, our intervention did not require special training, technology, EHR alerts, order sets, or staff nurses. Furthermore, the design and implementation of the intervention

Table 2
Breakdown of all encounters into screened, and positive GC/CT cases stratified by gender, from patients ages 13–18 for well-child visits from August 31, 2016, to November 30, 2020, at Crozer Pediatrics, Upland, PA, USA.

Encounters			Total, n (%)	Female, n (%)	Male, n (%)	Other, n (%)
Baseline (Before 09/2018)	Total		534	249 (46.6)	285 (53.4)	0 (0)
	Screened		89 (16.7)	34 (6.4)	55 (10.3)	0 (0)
	Positive	Total	13 (2.4)	6 (1.1)	7 (1.3)	0 (0)
		Chlamydia	12 (2.2)	6 (1.1)	6 (1.1)	N/A
		Gonorrhea	1 (0.2)	0 (0)	1 (0.2)	N/A
Intervention (After 09/2018)	Total		634	295 (46.5)	337 (53.2)	2 (0.3)
	Screened		530 (83.6)	252 (39.7)	276 (43.5)	2 (0.3)
	Positive	Total	24 (3.8)	14 (2.2)	10 (1.6)	0 (0)
		Chlamydia	22 (3.5)	13 (2.1)	9 (1.4)	0 (0)
		Gonorrhea	2 (0.3)	1 (0.1)	1 (0.2)	0 (0)

*The increase in screening rate between baseline and intervention groups was statistically significant, ($p < 0.001$).
**The number of positive STI cases as a proportion of total encounters between groups was not statistically significant ($p = 0.189$), as determined by chi-square analysis.

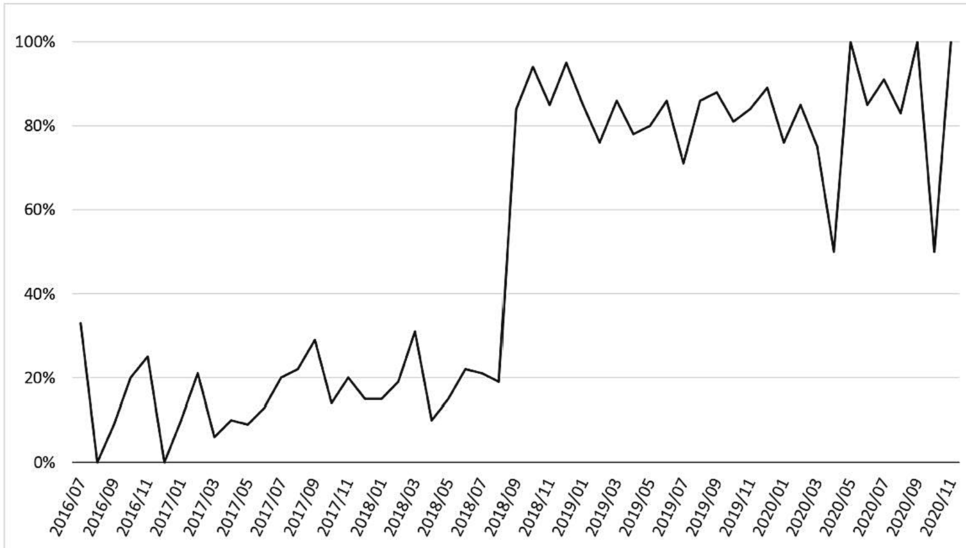

Fig. 2. Linear display of the percentage of all well-child encounters that included GC/CT screening, before and after the intervention (09/2018) from patients ages 13–18 presenting between August 31, 2016, and November 30, 2020, at Crozer Pediatrics, in Upland, PA, USA.

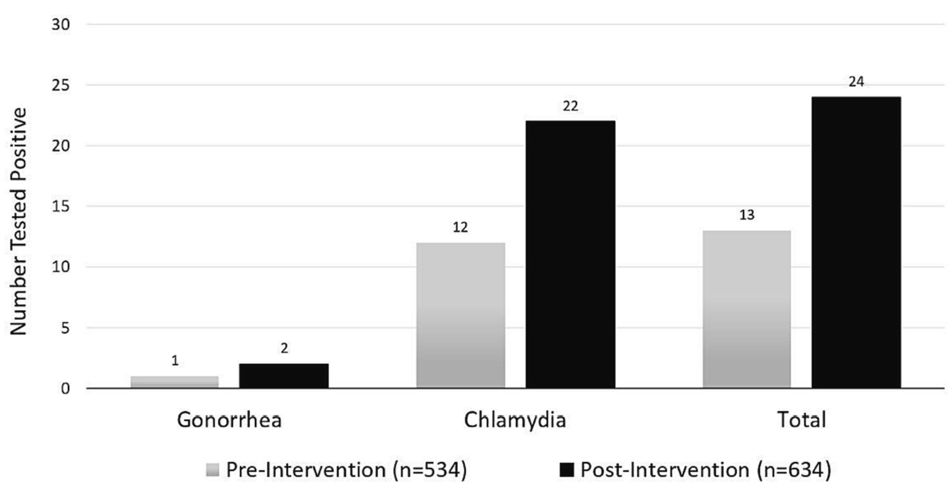

Fig. 3. Absolute number of positive GC/CT cases detected pre-intervention (n = 534) compared to post-intervention (n = 634) from patients ages 13–18 presenting for well-child visits between August 31, 2016, and November 30, 2020, at Crozer Pediatrics, in Upland, PA, USA.

was completed in less than one month. There was a sharp increase in testing rates secondary to the implementation of the opt-out method of testing in September 2018. Our results also illustrate the consistency with which the intervention was able to be implemented over the course of the two years even through the COVID-19 pandemic. This underscores the success of this intervention as it was implemented over a short timeframe and consistently increased testing with adherence from both providers and patients.

Based on current AAP recommendations, providers should use risk stratification to determine if a patient needs to be offered screening. A universal screening model streamlines the process for physicians, reducing potential bias in the risk stratification process. Based on results from our study, we believe that a universal screening approach may benefit individual patients and the adolescent population as a whole by allowing more teens to be treated for otherwise undiagnosed STIs that can have serious consequences on their health and quality of life. Our study and other similar studies (Allison et al., 2022; Tomcho et al., 2022), have now shown that universal screening is a viable and straightforward intervention that can be easily integrated into pre-existing practice.

Limitations of this study include the use of historical controls rather than an experimental control arm. Because of this, we could not control for differences in population prevalence of GC/CT between study periods. Race and ethnicity information were not consistently obtained at intake at Crozer Pediatrics and thus was not available for analysis. Another limitation is that the intervention was unable to achieve 100 % screening in the intervention group. Although reasons for opting out of testing were not consistently recorded, patients may have denied testing due to sexual inactivity, apprehension, or other factors. Also, only "well child" visits were included in the analysis which may further suggest that the population prevalence of STIs is underestimated even in the intervention group. Finally, this study was conducted in a single clinic, and while similar results have been achieved in other settings (Buzi et al., 2016; Allison et al., 2021; Cole et al., 2014; Allison et al., 2022; Tomcho et al., 2022; Goyal et al., 2014), it cannot be guaranteed that this intervention will be equally as effective everywhere.

Our study's largest strength is its ability to corroborate studies that have also demonstrated significant increases in STI screening and capture rates after the implementation of similar universal screening models. Although other studies (Allison et al., 2022; Tomcho et al.,

2022) differed in geographic region and population, the general trend holds true that an universal screening approach is associated with increased testing rates and increased detection of STIs in the adolescent population. This reaffirms the validity of previous studies and highlights the need for initiatives aimed at restructuring national pediatric guidelines to standardize universal STI testing. Additionally, our study demonstrates the feasibility of this intervention in low resource settings. Our protocol demonstrates a streamlined screening process that may serve as an example for organizations lacking high quality EHR systems and highly trained ancillary staff. Lastly, our study's success in quick integration in an exclusively resident based clinic suggests the replicability of this model in practices with various physician learner capabilities.

With increased capture of GC/CT, we expect to see higher treatment rates and an overall decline in transmission and secondary effects of infections such as PID and urethritis. Future studies should investigate the long-term impact of universal screening on both patient health and burden on the healthcare system.

5. Conclusion

Overall, this study highlights a pathway to implementing a universal screening protocol in almost any pediatric clinic with the use of minimal resources. Expanded guidelines may help normalize STI testing and conversations about sexual health with adolescents. Our results demonstrated that the implementation of a universal screening protocol can achieve higher screening and GC/CT capture rates. This intervention can be implemented in a short timeframe, with minimal burden on the system, and is readily achievable in an academic setting.

CRediT authorship contribution statement

Anthony Tirone: Writing – review & editing, Writing – original draft, Visualization, Project administration, Formal analysis, Data curation. **Laura Maule:** Writing – review & editing, Writing – original draft, Visualization, Project administration, Formal analysis, Data curation. **Jessie Huang:** Writing – review & editing, Writing – original draft, Visualization, Formal analysis. **Jenna Higgins:** Writing – original draft, Supervision, Methodology, Conceptualization. **Tanner Walsh:** Writing – original draft, Supervision, Methodology, Conceptualization. **Domenic Filingeri:** Methodology, Investigation, Conceptualization. **Alyssa Songveera:** Methodology, Investigation, Conceptualization. **Christina Poh:** Methodology, Investigation, Conceptualization. **Ashley N. Henderson:** Writing – original draft, Supervision, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

References

A new nonparametric Levene test for equal variances. Available at: https://psycnet.apa.org/record/2011-19444-011. Accessed March 26, 2023.
Allison, B.A., Walters, E.M., Butler, B.W., et al., 2021. A clinic-based quality improvement initiative to increase screening for gonorrhea and chlamydia in adolescents. Jt. Comm. J. Qual. Patient Saf. 47, 510–518.
Allison, B.A., Park, R.V., Walters, E.M., et al., 2022. Increased detection of gonorrhea and chlamydia after implementation of a universal screening protocol in a pediatric primary care clinic. Sex. Transm. Dis. 49, 117–122.
Arrington-Sanders, R., Hailey-Fair, K., Wirtz, A.L., et al., 2020. Role of structural marginalization, HIV stigma, and mistrust on HIV prevention and treatment among young black latinx men who have sex with men and transgender women: perspectives from youth service providers. AIDS Patient Care STDS 34, 7.
Bender, S.S., Fulbright, Y.K., 2013. Content analysis: a review of perceived barriers to sexual and reproductive health services by young people. Eur. J. Contracept. Reprod. Health Care 18, 159–167.
Bender, N., Herrmann, B., Andersen, B., et al., 2011. Chlamydia infection, pelvic inflammatory disease, ectopic pregnancy and infertility: cross-national study. Sex. Transm. Infect. 87, 601–608.
Bowen, V., Braxton, J., Davis, D., 2019. Sexually transmitted disease surveillance. National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (US) Division of STD Prevention.
Bright Futures Adolescence Tools, 2023. Available at: https://www.aap.org/en/practice-management/bright-futures/bright-futures-materials-and-tools/bright-futures-tool-and-resource-kit/bright-futures-adolescence-tools/. Accessed July 17, 2023.
Buzi, R.S., Madanay, F.L., Smith, P.B., 2016. Integrating routine HIV testing into family planning clinics that treat adolescents and young adults. Public Health Rep. 131 (Suppl 1), 130–138.
Chin, H.B., Sipe, T.A., Elder, R., et al., 2012. The effectiveness of group-based comprehensive risk-reduction and abstinence education interventions to prevent or reduce the risk of adolescent pregnancy, human immunodeficiency virus, and sexually transmitted infections: two systematic reviews for the guide to community preventive services. Am. J. Prev. Med. 42, 272–294.
Chlamydia screening among females aged 15-21 years–multiple data sources, United States, 1999-2010 – PubMed. Available at: https://pubmed.ncbi.nlm.nih.gov/25208262/. Accessed March 26, 2023.
Cole, J., Hotton, A., Zawitz, C., et al., 2014. Opt-out screening for Chlamydia trachomatis and Neisseria gonorrhoeae in female detainees at Cook County jail in Chicago, IL. Sex. Transm. Dis. 41, 161–165.
Cook, R.L., Wiesenfeld, H.C., Ashton, M.R., et al., 2001. Barriers to screening sexually active adolescent women for chlamydia: a survey of primary care physicians. J. Adolesc. Health 28, 204–210.
Fiscus, L.C., Ford, C.A., Miller, W.C., 2004. Infrequency of sexually transmitted disease screening among sexually experienced U.S. female adolescents. Perspect. Sex. Reprod. Health 36, 233–238.
Goyal, M.K., Witt, R., Hayes, K.L., et al., 2014. Clinician adherence to recommendations for screening of adolescents for sexual activity and sexually transmitted infection/ human immunodeficiency virus. J. Pediatr. 165, 343–347.
Henry-Reid, L.M., O'Connor, K.G., Klein, J.D., et al., 2010. Current pediatrician practices in identifying high-risk behaviors of adolescents. Pediatrics 125.
Kreisel, K.M., Spicknall, I.H., Gargano, J.W., et al., 2021. Sexually transmitted infections among US women and men: prevalence and incidence estimates, 2018. Sex. Transm. Dis. 48, 208–214.
LeFevre, M.L., 2014. Screening for chlamydia and gonorrhea: U.S. Preventive services task force recommendation statement. Ann. Intern. Med. 161, 902–910.
Murray, P.J., Braverman, P.K., Adelman, W.P., et al., 2014. Screening for nonviral sexually transmitted infections in adolescents and young adults. Pediatrics 134.
Pennsylvania Department of Health, 2020. Enterprise Data Dissemination Informatics Exchange (EDDIE).
Pinto, C.N., Dorn, L.D., Chinchilli, V.M., et al., 2018. Chlamydia and gonorrhea acquisition among adolescents and young adults in Pennsylvania: a rural and urban comparison. Sex. Transm. Dis. 45, 99–102.
Shannon, C.L., Klausner, J.D., 2018. The growing epidemic of sexually transmitted infections in adolescents: a neglected population. Curr. Opin. Pediatr. 30, 137–143.
Tomcho, M.M., Lou, Y., O'Leary, S.C., et al., 2021. An intervention to improve chlamydia and gonorrhea testing among adolescents in primary care. Pediatrics 148.
Tomcho, M.M., Lou, Y., O'Leary, S.C., et al., 2022. Closing the equity gap: an intervention to improve chlamydia and gonorrhea testing for adolescents and young adults in primary care. J. Prim. Care Community Health 13.
Vermund, S.H., Geller, A.B., Crowley, J.S., 2021. Sexually transmitted infections: adopting a sexual health paradigm. Sex. Transm. Infect. 1–750.
Wiehe, S.E., Rosenman, M.B., Wang, J., et al., 2011. Chlamydia screening among young women: individual- and provider-level differences in testing. Pediatrics 127.
Workowski, K.A., Bachmann, L.H., Chan, P.A., et al., 2021. Sexually transmitted infections treatment guidelines, 2021. MMWR Recomm. Rep. 70, 1–187.