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The preferences of adult outpatients in medical or dental care settings for giving saliva, urine or blood for clinical testing

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Abstract

Background—The design of new diagnostic tests would benefit from knowing patients' preferences for the collection of bodily fluids. These preferences, however, are unknown. The authors assessed patients' preferences for the collection of saliva, urine and blood as diagnostic fluids.

Methods—The authors handed out surveys adult outpatients who sought treatment at two medical care sites and one dental care site at a medical center regarding the comfort, convenience and ease of collection of saliva, urine and blood for diagnostic testing.

Results—A total of 413 surveys were completed. Subjects regarded the donation of saliva as more comfortable and convenient than that of blood or urine at the doctor's (physician's or dentist's) office, and they reported that saliva and urine are easiest to collect at home compared with blood. Male subjects and subjects who had ever donated saliva were more likely to perceive saliva donation in

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the doctor's office favorably. Subjects at all care sites regarded the donation of saliva as more comfortable and convenient than that of blood or urine; however, subjects at the dental care site perceived saliva donation more favorably than did subjects at the medical care sites. In addition, respondents said they were more willing to participate in research and medical testing if it required saliva donation rather than urine or blood collection.

Conclusions—In terms of convenience and comfort, saliva compared well with blood and urine as a diagnostic fluid for clinical and research testing. Patients who sought care at both medical and dental sites shared these perceptions.

Clinical Implications—Given strong patient preferences, saliva may be the fluid of choice for the development and implementation of patient-centered diagnostic tests in research and practice.

Keywords

Saliva; diagnosis; health care utilization; clinical practice

Clinical practice and research rely on the collection of bodily fluids—namely, blood and urine—to answer important questions about patients' health and risk status. In addition, federal and industrial funding sources have been used to develop saliva-based diagnostic tests,^{1,2} and considerable progress has been made to elucidate the proteome and transcriptome of human saliva.^{3–8}

A variety of clinical conditions can be assessed by using saliva as a diagnostic biofluid.⁹ For example, data are available that correlate levels of specific salivary proteins or RNAs with parameters of oral cancer^{7,8,10} and breast cancer.^{3,4} Oral fluid-based tests also exist or are being developed to detect a variety of infectious diseases (including HIV, parvovirus, acute hepatitis, dengue fever and malaria), as well as to detect alcohol and drug use and steroid hormone levels.^{9–11}

One of the key presumed advantages of using saliva as a diagnostic tool is that it is easier to collect and avoids the invasiveness and discomfort associated with collecting blood and the inconvenience associated with collecting—and the occasional inability to collect—urine. In a 1999 workshop summary report sponsored by the National Institutes of Health, National Institute of Dental and Craniofacial Research, Tender and DePaola¹ promoted ease of collection and noninvasiveness as principal advantages of saliva over other diagnostic fluids. However, when we conducted a literature search of medical and dental databases, we found no patient or practitioner data to support the assumption that saliva is easier than other traditional diagnostic fluids to collect. Without a demand from patients for salivary testing or a favorable reception of salivary tests by health care practitioners, saliva is unlikely to be used as often as blood and urine are for diagnostic testing.

In this study, we investigated perceptions of patients and potential research subjects regarding their preferences for donating blood, urine and saliva for diagnostic testing.

SUBJECTS AND METHODS

Research questions

We designed our investigation to answer the following specific questions:

- Of the three fluids—saliva, urine and blood—which is the most comfortable and convenient to give in the doctor's (physician's or dentist's) office?
- Which is easiest to collect at home?

–What are the demographic and experiential (for example, past fluid donation) correlates of comfort and convenience of giving saliva in the doctor’s office and ease of collecting it at home?

–What percentage of patients would be interested in participating in a research study if saliva were collected versus if urine, blood or both were collected?

Questionnaire development

We conducted a literature search to establish the content validity of the survey instrument. We found no previous studies in which perceptions of saliva collection had been investigated. Thus, our questionnaire was drafted de novo by the principal investigator (S.K.) and the director of the Mayo Clinic Survey Center (Rochester, Minn.) (T.J.B.). Other research team members modified the survey content and wording before administering it to 15 volunteers (health care workers and lay people) who took part in informal cognitive interviews to further refine the instrument. (For the final version of this questionnaire, see the supplemental data to the online version of this article at “<http://jada.ada.org>”.)

Survey procedure

From July 1, 2006, through Oct. 31, 2006, we asked patients arriving for appointments at the Mayo Clinic to complete the questionnaire while waiting and to return the completed questionnaire to the receptionist before their appointment. Specifically, patients’ appointments were at the Department of Family Medicine, in which adults and children are treated for illnesses and receive well care, including obstetrical care; the Department of Primary Care Internal Medicine, in which care is provided to Mayo Clinic employees and their adult dependents, as well as other members of the Rochester, Minn., community; and the Department of Dental Specialties, in which patients receive a range of dental and dental hygiene procedures.

The subject population was self-selected and represented a convenience sample. We handed out and collected questionnaires until at least 400 had been completed. We did not record the number of subjects who were offered the opportunity to participate but who declined. Subjects volunteered and received no remuneration. The Mayo Clinic Institutional Review Board approved all procedures.

Statistical analysis

We compared subjects’ preferences for donating saliva, blood and urine and for participating in research by using the χ^2 test for homogeneity. We also conducted a univariate analysis by using logistic regression (dichotomizing the dependent variable as saliva versus other) to determine the effect of a predictor (respondent background variables such as sex, age and race/ethnicity, as well as some experiential variables such as past collection of saliva, urine, blood or any combination of the three for a medical only appointment or research study) on preferences. Of primary interest was whether past experiences with fluid donation shaped subjects’ opinions about providing saliva for clinical or research testing, as well as their perceptions about the convenience, comfort and ease of collection. We estimated these associations by using odds ratios (ORs) and 95 percent confidence intervals (CIs). Finally, we used a Bowker test of symmetry to compare the subjects’ interest levels for donating saliva versus urine and blood. We performed all analyses by using statistical software (SAS, Version 9.1, SAS Institute, Cary, N.C.), and we considered a two-sided *P* value of less than or equal to .05 to indicate statistical significance.

RESULTS

Sample characteristics

Of the 430 surveys we handed out, 413 were completed. A total of 72.9 percent of the subjects were women, 27.1 percent were younger than 40 years, 30.8 percent were 60 years or older, and 93.2 percent were white (Table 1). Thirty-four percent of respondents completed the survey while visiting the Department of Dental Specialties.

Comfort, convenience and ease of saliva collection

Table 2 shows the study results, demonstrating preferences for saliva over blood or urine across the domains of comfort and convenience. Subjects regarded the donation of saliva as being more comfortable at a doctor's office (44.6 percent) than that of urine (23.2 percent) and blood (32.2 percent) and as being more convenient at a doctor's office (57.2 percent) than urine (13.4 percent) and blood (29.5 percent). Subjects reported that saliva (45.9 percent) and urine (54.1 percent) were easiest to collect at home, compared with blood (0.0 percent). We found that subjects who had ever donated saliva (OR = 2.4; 95 percent CI, 1.3–4.4) were more likely to perceive favorably. The subjects did not have equally similar perceptions of the three fluids in terms of comfort and convenience (each P value < .001). However, the subjects' perception of the difference among the three fluids regarding ease of home collection did not reach statistical significance. Table 3 shows that respondents at the dental and medical sites viewed donating saliva as more comfortable and more convenient than donating urine and blood.

Table 4 shows the results of our univariate logistic regression analyses. We found that male subjects and subjects who completed the survey at the dental care site perceived saliva donation as significantly more comfortable and convenient than urine and blood donation. Furthermore, we found that subjects who had given a saliva sample at a medical or research study appointment in the past perceived saliva donation as significantly more comfortable and convenient than urine and blood donation. None of the other background (age or site of survey completion) or experiential (have you ever given urine or blood?) variables included in the analyses were significantly associated with perceptions of comfort, convenience or ease of at-home collection. The site at which subjects completed the surveys influenced their preferences for saliva, urine or blood; subjects at the dental site perceived saliva donation as more comfortable and convenient than did subjects at the medical sites. However, subjects at all sites viewed saliva donation as more comfortable and convenient than urine and blood donation (Table 3).

Interest in giving saliva for research purposes

The figure shows the results of our study regarding subjects' interest in donating saliva, urine and blood for a research study. Overall, subjects reported that they would be more interested in participating in a research study if the investigator were collecting saliva than if he or she were collecting urine or drawing blood (Bowker test of symmetry, P < .001 for saliva versus urine and P < .001 for saliva versus blood).

In a separate analysis (data not shown), we found a strong preference in subjects who had ever given urine (OR = 3.6; 95 percent CI, 1.9–6.9; P < .001) or blood (OR = 4.3; 95 percent CI 2.0–9.3; P < .001) at a medical or research study appointment for participating in a research study if saliva, rather than urine or blood, were collected. History of donating saliva did not affect subjects' willingness to participate in future research testing involving blood or urine.

DISCUSSION

Advances in the understanding of saliva testing, along with data that correlate salivary biomarker levels with a variety of oral and systemic conditions, justify continued investigation of saliva as a diagnostic fluid. A favorable reception for a novel saliva-based diagnostic test methodology would help promote it in an area dominated by blood-and urine-based tests. However, patients' level of awareness of and receptivity toward saliva-based tests has been unknown. To our knowledge, our study is among the first to offer insights on this issue and move our understanding from mere conjecture to the realm of empirical evidence.

In our study, we found that outpatients seeking medical or dental care at Mayo Clinic reported that collection of saliva compared favorably with that of blood and urine. They reported that saliva was better than blood and urine in terms of comfort and convenience of collection in a doctor's office and ease of home collection. Also, more subjects were interested in donating saliva than blood or urine for a research or medical test. Men, who do not always seek diagnostic care to the same degree as women,¹² and patients who had ever donated saliva held favorable views of saliva donation. Even though subjects at the dental care site perceived saliva donation more favorably, subjects at the medical care sites also viewed saliva donation as significantly more comfortable and convenient than urine or blood donation. This finding is of interest because it suggests that saliva-based tests may be useful in an array of health care settings and not just in dental environments.

Limitations and strengths of the study

Our study's limitations included concerns about applicability (do the results generalize to other populations?) and causal-temporal inferences (are preferences to participate in research colored by prior experiences donating blood or urine?). We did not give the subjects any details about saliva, urine or blood collection methods to consider before taking the survey, so it is likely that they were thinking of spitting into a cup or container. In this initial study, we present a straightforward analysis of the perceptions of saliva collection while acknowledging that, in future studies, other issues related to saliva collection methods, such as saliva stimulation, merit investigation.

The format for the survey was simple. We asked subjects to indicate their preferences by using terms such as "most," "least" and "easiest." An alternative format, and one that may have provided a finer level of discrimination among the three fluids, would have been to develop questions regarding each type of specimen by using a Likert-scale response format. A key limitation, however, is that many of the subjects had not ever donated saliva, and, as a result, their preferences regarding saliva donation were less informed than were those regarding urine and blood donation. We found it reassuring that subjects who had ever donated saliva had stronger preferences for this methodology than did those who had not, which strengthens our inferences that saliva collection would be perceived favorably.

Our study's strengths included that it had a 96 percent response rate and that, to our knowledge, it was the first study to offer insights on patients' preferences about the collection of any bodily fluids.

Implications for clinical policy and research

Patients' preferences for saliva collection coincide with interests of health care providers and researchers in developing saliva-based tests.¹ These developments have not affected clinical practice, perhaps because of the lack of available, accessible and affordable salivary tests for common conditions; limited knowledge of providers about the salivary tests that are available to them; and providers' preferences for saliva-based testing.

Patients' preferences for the collection of saliva rather than the collection of blood and urine have not been known. The results of our study show that patients prefer to donate saliva rather than blood or urine for clinical and research testing. Furthermore, the preferences relate to perceptions of convenience and comfort. These findings are important because they validate a hitherto untested assumption that patients prefer giving saliva because it is easy and noninvasive to collect. The effect of saliva-based tests may be broad in a variety of health care settings given the favorable view of saliva collection held by subjects in medical settings. The scientific community can be confident that patients will react favorably toward this diagnostic fluid alternative. Nevertheless, further research is needed to understand additional barriers—especially those relating to diagnostic test-ordering practices of health care providers—to the introduction of salivary testing in clinical medical and dental practice.

CONCLUSIONS

Our study results show that patients prefer to donate saliva rather than blood and urine for diagnostic testing in clinical practice and research. With the development of accurate, inexpensive and accessible tests, saliva may become the fluid of choice for patient-centered diagnostic testing.

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Figure.
Percentage of subjects interested in donating saliva, urine or blood for a research study.

TABLE 1

Subjects' demographic data.

CHARACTERISTIC	PERCENTAGE
Age (Years)	
< 30	15.5
30–39	11.6
40–49	21.8
50–59	19.4
60–69	14.8
70–79	11.6
80–89	4.4
No answer	0.9
Race	
White	93.2
Asian	4.1
African-American	0.5
Pacific Islander	0.2
American Indian	0.0
No answer	2.0
Sex	
Female	72.9
Male	27.1

TABLE 2

Subjects' preferences regarding comfort, convenience and ease of donating saliva, urine and blood.*

FLUID	MOST COMFORTABLE TO GIVE IN DOCTOR'S OFFICE [†] (%)	MOST CONVENIENT TO GIVE IN DOCTOR'S OFFICE [†] (%)	EASIEST TO COLLECT AT HOME [†] (%)
Saliva	44.6	57.2	45.9
Urine	23.2	13.4	54.1
Blood	32.2	29.5	0.0

* Column totals differ because not all respondents answered all questions.

[†] On the basis of the χ^2 test for homogeneity, the subjects did not have equally similar perceptions of collecting the three fluids in terms of comfort ($P < .001$), convenience ($P < .001$) and ease at home ($P < .001$).

TABLE 3

Subjects' saliva, urine and blood donation preferences, by site.*

SITE (CATEGORY)	SALIVA(%)	URINE(%)	BLOOD(%)	P VALUE
Dental				
Comfort	53	21	26	< .001
Convenience	70	9	21	< .001
Medical				
Comfort	40	24	26	.006
Convenience	51	16	34	< .001

* On the basis of the χ^2 test for homogeneity, the subjects from the different care sites did not have equally similar perceptions of the three fluids in terms of comfort ($P < .001$) and convenience ($P < .001$).

TABLE 4
Logistic regression of saliva donation preferences for selected experiential and background variables.

VARIABLE	SALIVA MOST COMFORTABLE TO GIVE IN DOCTOR'S OFFICE		SALIVA MOST CONVENIENT TO GIVE IN DOCTOR'S OFFICE		SALIVA EASIEST TO COLLECT AT HOME	
	OR* (95% CI) [†]	P Value	OR (95% CI)	P Value	OR (95% CI)	P Value
Background						
Sex (reference, female)	1.9 (1.2–3.0)	.006	2.6 (1.6–4.2)	< .001	0.8 (0.5–1.3)	.47
Age (odds per 10-year increase in age)	1.0 (0.9–1.1)	.45	0.9 (0.8–1.1)	.31	1.0 (0.9–1.1)	.60
Site of survey completion (reference, medical care site)	1.7 (1.1–2.6)	.013	2.3 (1.5–3.5)	< .001	1.3 (0.9–1.9)	.23
Experiential (Yes Versus No)						
Ever given saliva for a medical appointment?	2.4 (1.3–4.4)	.006	2.3 (1.2–4.6)	.012	1.1 (0.6–2.0)	.73
Ever given urine for a medical appointment?	0.9 (0.5–1.7)	.68	0.9 (0.5–1.7)	.75	1.5 (0.8–2.8)	.24
Ever given blood for a medical appointment?	0.6 (0.3–1.4)	.24	0.7 (0.3–1.5)	.36	1.3 (0.6–2.7)	.52

* OR: Odds ratio.

[†] CI: Confidence interval.