Improving Symptom Management in Hemodialysis Patients: Identifying Barriers and Future Directions

Rachel Feldman, BSN,¹ Nathaniel Berman, MD,^{2,3} M. Cary Reid, MD, PhD,¹ Jordan Roberts, AB,¹ Rouzi Shengelia, MD,¹ Kaylan Christianer, BS,¹ Brian Eiss, MD,¹ and Ronald D. Adelman, MD¹

Abstract

Background: Hemodialysis (HD) patients experience significant symptom burden that is often undertreated.

Objective: This study identified (1) barriers to symptom management in the HD population, (2) potential targets for improving symptom burden, (3) provider attitudes toward palliative care for HD patients, and (4) perceptions of how transplant eligibility impacts care.

Design: Semistructured, one-on-one interviews were conducted, audiotaped, and transcribed. Data were analyzed qualitatively by two investigators to identify discrete themes.

Setting/subjects: Health care providers (HCPs) and caregivers were recruited (June to October 2012) from three outpatient HD units in New York City.

Measurements: Open-ended questions were used with follow-up probes.

Results: Interviews were completed with 34 HCPs (8 physicians, 2 nurse practitioners, 4 social workers, 13 registered nurses, 7 patient care technicians) and 20 caregivers (14 family members, 5 home health aides, 1 friend). Barriers to symptom control were identified in three areas: (1) provider unawareness of symptoms, (2) provider's uncertainty as to whose responsibility it is to treat symptoms, and (3) inherent difficulty in symptom management. Ideas for ameliorating symptoms included enhancing systems for patient/caregiver education, improving systems for HCP communication with other disciplines, and encouraging alternative methods of dialysis when appropriate. HCPs also expressed discomfort with the term "palliative care."

Conclusions: Renal HCPs are often unaware of the magnitude of symptom burden in their HD patients. This study found that there is lack of ownership for assessing and treating these symptoms. Providers also feel certain symptoms are "untreatable." Research is needed to develop effective treatment strategies for HD populations.

Introduction

THERE WERE NEARLY 376,000 chronic hemodialysis (HD) patients in the United States and over 114,000 incident cases of end-stage renal disease (ESRD) in 2010 alone.¹ Treatment of this patient population is associated with frequent hospitalizations and enormous costs. In addition, studies in the ESRD population have reported that HD patients suffer from a symptom burden similar to cohorts with end-stage lung disease and heart disease.² Symptoms may be due to concurrent chronic diseases such as diabetes, arthritis, heart disease, or uremia itself. Furthermore, HD itself is time consuming and associated with multiple symptoms. Patients endorse high rates of fatigue, difficulty sleeping, sexual dysfunction, and reduced quality of life.³

There is evidence that HD patients are undertreated for pain⁴ and depression⁵ and these patients would benefit from palliative care interventions.⁶ One limiting factor may be that providers are unaware of patients' symptoms.⁷ Furthermore, surveys of treating nephrologists indicate that among HD practitioners many consider symptom management, particularly pain, sexual dysfunction, and depression, the responsibility of other health care providers.⁸

Little is known regarding the attitudes of interdisciplinary members of the HD team, patient aides, and family members toward symptom management among affected patients. HD nurses, technicians, and social workers are intimately involved in patient care, and in many cases have a better sense of patient complaints and concerns than do patients' treating physicians. The current study employs in-depth interviews

¹Division of Geriatrics, ²Division of Nephrology and Hypertension, Weill Cornell Medical College, New York, New York.

³Rogosin Institute, New York, New York.

Accepted July 19, 2013.

with multiple stakeholders (e.g., nephrologists, registered nurses, caregivers) to ascertain their perceived barriers to symptom management among HD patients, generate hypotheses regarding how best to improve the management of burdensome symptoms, and assess HD provider attitudes regarding palliative care. Additionally, since our prior work has shown that HD patients who are ineligible for renal transplantation report greater levels of symptom burden,⁹ we explored provider perceptions of how transplant eligibility status impacts care.

Methods

Study sites

Subjects were recruited from three outpatient HD units between June 2012 and October 2012. All three units are part of the Rogosin Institute (a treatment and research center for kidney disease that is a member of the New York–Presbyterian Healthcare System) and are located in (1) Manhattan, (2) Woodside, New York, and (3) Flushing, New York. The three units serve a population of approximately 600 patients who receive care from 9 physicians, 2 nurse practitioners, 27 registered nurses, 37 patient care technicians, and 5 social workers. We sampled from three sites to increase the diversity of participants. This study was approved by the Weill Cornell Medical College institutional review board, and all participants (health care providers and caregivers) provided written informed consent.

Study participants and sample assembly

Health care providers (HCPs), including physicians (MDs), nurse practitioners (NPs), registered nurses (RNs), social workers (SWs), and patient care technicians (PCTs) met eligibility criteria if their role included care of patients receiving in-center HD. All MDs and NPs employed at the three study sites were first contacted by e-mail and were later approached in person to participate. RNs, PCTs, and SWs were approached in person during recruiting sessions that took place during morning and afternoon HD shifts. We chose not to include patients in the present study because they were the focus of another recent study by our team that assessed symptom burden.⁹

During recruiting sessions, HCPs assisted with targeted recruitment of family members and home health aides (HHAs) who were actively involved in the care of patients receiving in-center HD. Family members and HHAs were personally approached by a member of the research team in the waiting room or at the chairside. Those who self-identified as being a “primary caregiver” and spoke English met eligibility criteria.

Interview methodology

One-on-one in-depth interviews were conducted in person by a member of the research team (RF or RS). The interviewers explained the purpose of the study and then generated a discussion that included open-ended questions. The list of questions posed to each participant was uniform, and follow-up probes were used as needed to elicit clarification.

With the goal of understanding what makes symptom management difficult, providers were asked to list bothersome symptoms that patients report, describe how symptoms

are managed by the HD team, and brainstorm about ways to improve management. To assess perceptions of palliative care, HCPs were asked to define palliative care as it relates to dialysis patients. HCPs were also asked to comment on whether transplant ineligible HD patients are managed differently than transplant eligible patients.

Caregivers were asked to list bothersome symptoms that patients whom they care for reported; explain how they help their relative, client, or friend cope with the symptoms; describe what factors are helpful in palliating the symptoms; and brainstorm how the symptoms could be better managed.

All subjects filled out a brief, self-administered questionnaire to ascertain demographics and length of time caring for a patient on HD.

Analysis

The interviews were audiotaped and transcribed verbatim, and the data were analyzed for thematic content using a grounded theory approach.¹⁰ Two investigators (RF and JR) independently analyzed the interview transcripts; and preliminary codes were generated based on barriers to symptom management, ideas regarding how to better manage symptoms, attitudes toward palliative care, and perceptions of transplant eligibility as related to symptom burden. Each investigator then independently quantified the number of times that each theme appeared among participants. RF and JR met to discuss their observations and reconcile divergent interpretations.

Participants

Interviews were conducted with 34 HCPs (8 MDs, 2 NPs, 4 SWs, 13 RNs, and 7 PCTs) and 20 caregivers (5 HHAs, 14 family members, and 1 friend). Interviews lasted between 14 and 50 minutes (mean length 21 minutes). Participant demographic information is shown in Table 1. With the exception of one physician at the Woodside site who did not participate due to scheduling conflicts, all eligible MDs and NPs participated ($n=10$). All eligible SWs participated ($n=4$) and approximately 31% of eligible RNs and PCTs participated. Three HHAs, 2 family members, 2 RNs, and 1 PCT who were approached declined participation due to scheduling conflicts or they did not wish to be recorded.

Results

Summary of interview results

The data were organized into four main categories: (1) perceived barriers to symptom management, (2) potential targets for improving symptom burden, (3) provider attitudes toward palliative care for HD patients, and (4) perceptions of how transplant eligibility may impact care. The number of participants who endorsed each theme was quantified. Differences among HCP groups are described in the text where applicable.

Barriers

Three major barriers to symptom management of HD patients emerged: (1) HCPs are unaware of patient symptoms, (2) HCPs do not feel it is their role to treat these symptoms, and (3) symptom management is challenging. Table 2 shows the number of participants endorsing each barrier.

TABLE 1. PARTICIPANT DEMOGRAPHICS

	Physicians (MDs) and nurse practitioners (NPs)	Registered nurses (RNs) and patient care technicians (PCTs) ^a	Social workers (SWs)	Caregivers ^b
N	10	20	4	20
Mean age	51.9 ± 4.1	44 ± 9.9	50.5 ± 11.3	60.1 ± 14.7
% Male	70	30	25	30
% White	60	25	100	35
% African American	10	15	—	40
% Asian	30	55	—	5
% Hispanic	—	5	—	15
Mean years caring for patient(s) on dialysis	18.6 ± 14.0	10.1 ± 7.2	11.8 ± 5.9	3.4 ± 3.6

^aOne participant identified as Caucasian and Hispanic and another participant identified as Guyanese.

^bOne participant chose not to fill out race.

The most commonly described barrier that HCPs (41%) and caregivers (40%) felt contributed to a lack of symptom awareness was patient resignation leading to underreporting. Among HCPs, this barrier was more commonly raised by RNs, PCTs, and SWs (50%)—and less by MDs (20%). As one MD described,

“A lot of times you walk around a dialysis unit you’ll notice something, which is everyone is asleep and that in some ways is really a remarkable metaphor for how a lot of patients here deal with their issue, which is go to sleep.”

As described by HCPs (17%) and caregivers (20%), the HD environment does not provide adequate privacy. One RN related that,

“It’s very public here, a lot of patients are probably afraid to talk about what they really want to talk about.”

Three additional factors were identified that may contribute to provider unawareness, including (1) inadequate time for patients to report symptoms due to abbreviated contact with MDs or NPs; (2) variable symptomatology based on timing in relation to dialysis, i.e., symptoms may worsen once the patient has gotten home after treatment; and (3) patient unawareness of who to report symptoms to.

There are a number of reasons why dialysis providers may not take ownership for symptom management. Some HCPs (44%) felt that better adherence to the current dialysis prescription could adequately ameliorate symptoms. One PCT explained,

“[Symptoms will improve] if they are compliant and just do their treatment religiously. That way their symptoms can improve or at least they’re not feeling sick all the time.”

A substantial minority (35%) of HCPs expressed that it is not their role to manage symptoms that they feel are unrelated to dialysis (i.e., pain or nausea). According to one MD,

“Our focus is really on their dialysis program. Considering their other comorbidities is really in the purview of that particular specialist.”

Some HCPs (15%) specifically expressed reluctance to dispense narcotics or psychiatric medications.

Finally, many HCPs expressed that symptom management is inherently challenging in the HD population. A significant minority of HCPs (47%), particularly physicians (80%), expressed that symptoms are simply an unavoidable outcome of dialysis. As one MD explained,

“You kind of feel helpless. I don’t know what else I should be doing to make them feel better. I don’t know what else I should be offering as a physician because they’re so miserable.”

Many providers, particularly MDs and NPs (70%) more so than RNs and PCTs (20%), reported confidence that lengthening HD treatment times could be beneficial for ameliorating symptoms, but explained that patients are resistant to longer treatment times. One MD related,

TABLE 2. BARRIERS TO SYMPTOM MANAGEMENT

	Healthcare providers (N = 34)	Caregivers (N = 20)
HCPs are unaware of symptoms		
Patient resignation leads to underreporting	14 (41%)	8 (40%)
Dialysis environment is not conducive to privacy	6 (17%)	4 (20%)
Inadequate time for patient to report	7 (21%)	1 (5%)
Variable symptomatology based on timing in relation to dialysis	5 (15%)	—
Patients do not know who to report symptoms to	4 (12%)	—
HCPs do not feel symptom management is their role		
Better adherence to current hemodialysis prescription would ameliorate symptoms	15 (44%)	2 (10%)
Only symptoms related to dialysis should be treated by renal team	12 (35%)	—
Reluctance to dispense narcotics and psychiatric medications	5 (15%)	—
Symptom management is difficult in the HD population		
Symptoms are an unavoidable outcome of dialysis	16 (47%)	6 (30%)
Patients are resistant to longer treatments necessary to palliate symptoms	14 (34%)	4 (20%)
Time constraints/inadequate staffing	13 (38%)	7 (35%)
Financial considerations	7 (21%)	1 (5%)
Scarce outpatient palliative care services	4 (12%)	1 (5%)

"Cutting treatments is probably the worst way to treat the symptoms of dialysis. What I really do when they start to feel like that is I tell them to come in for extra treatments—maybe 20% of them will agree."

HCPs (38%) and caregivers (35%) felt that time constraints and inadequate staffing also make symptom control difficult. HCPs (21%) and one caregiver (5%) cited financial considerations, such as inadequate reimbursements to dialysis providers for offering extra treatments or for providing symptom management.

Potential targets

Providers and caregivers discussed a diverse range of ideas for changes in HD care practice that could potentially enhance symptom management (see Table 3). The most frequently cited idea from HCPs (44%) was to create improved, dedicated systems for patient and caregiver education. HCPs felt that patients are not well informed about why symptoms occur and about how to be proactive in managing them. Caregivers (20%) agreed that improved systems for patient education would be beneficial.

Several participants (29% of HCPs, 5% of caregivers) felt that better communication with non-HD providers such as primary care providers, psychiatrists, and physical therapists would be helpful in ameliorating symptoms. As stated by one NP,

"We do a lot of referrals and we get a discharge summary most of the time, but sometimes when you refer patients you don't get a call back or a note saying this was done. I think that interdepartmental communication could be improved."

Among MDs and NPs the most frequently occurring idea (60%) was to encourage alternative methods of dialysis (i.e., daily home HD or peritoneal dialysis) when appropriate.

HCP attitudes toward palliative care

To assess receptivity to palliative care, providers were asked to describe what "palliative care" means in terms of caring for patients on dialysis (see Table 4). Many providers responded that palliative care means end-of-life care (26%), that palliative care is not part of routine HD care (21%), or that the name has a negative connotation to patients (18%). One physician responded,

TABLE 4. HEALTH CARE PROVIDER ATTITUDES TOWARD PALLIATIVE CARE AND THE USE OF TRANSPLANT ELIGIBILITY STATUS

	Health care providers (N = 34)
Attitudes toward palliative care	
Palliative care means "end-of-life" care	9 (26%)
Palliative care is not a part of routine HD care	7 (21%)
The term palliative care has a negative connotation to patients	6 (18%)
Attitudes toward the use of transplant eligibility status	
Treatment is tailored during dialysis sessions based on patient but not transplant eligibility status	11 (32%)
Treatment is tailored based on age and comorbidities but not transplant eligibility status	8 (24%)
Treatment goals are less rigid for a patient who is frail, elderly, and not eligible for transplant	5 ^a (15%)

^aAll five providers endorsing this theme were physicians.

"My work doesn't involve that very much. Palliative care is mostly a hospital-based thing, which I don't deal with too much. It means cutting down the dialysis and giving patients pain medicines and they sleep their way to death."

Other participants felt that palliative care-type interventions could be beneficial to patients, but felt the name is intimidating. One physician explained,

"I think you have to call it something other than palliative care, because a lot of them already feel like they're being left there to die, when that's not really the way you're thinking about it. Palliative care needs a new gig, a new name."

Attitudes regarding use of transplant eligibility status

Providers were asked whether transplant eligibility status plays a role in management of patients (see Table 4). One half of the participating MDs/NPs ($n=5$) reported that treatment goals might be less rigid for a patient who is elderly, frail, and not eligible for a transplant, although they explained that there is not a formal system for making changes to the dialysis prescription. According to one physician,

"[For patients who are not transplant eligible] I do think more about symptom management rather than aggressive care. I'm not necessarily trying to have a great five-year survival. My aim is to keep the patient comfortable and to reduce hospitalizations. I think that for patients who are not transplantable, older, or frail, most nephrologists will try to just let dialysis be a process that runs as smoothly as possible, versus complicates things."

One physician shared a different sentiment,

"You want the patient prepared if they're going to get a transplant to be in the best possible shape for the procedure and if they're not going to get a transplant and it looks like they're going to be on dialysis for

TABLE 3. IDEAS FOR IMPROVEMENT

	Health care providers (N = 34)	Caregivers (N = 20)
Dedicated programs for patient education	15 (44%)	4 (20%)
Improved systems for communication with other disciplines	10 (29%)	1 (5%)
Improved cultural sensitivity	10 (29%)	1 (5%)
Alternative methods of dialysis when appropriate	9 (26%)	2 (10%)
Promote life outside dialysis	6 (18%)	6 (30%)
Make dialysis time more productive	5 (15%)	3 (15%)
Time with care providers away from the chairside	3 (9%)	1 (5%)

10+ years, you want them to be in the best possible shape. So you don't alter the dialysis."

Other participants expressed that treatments are uniform and do not take transplant eligibility into consideration. Some (32%) felt that treatment modifications are individualized and primarily based on what each patient can tolerate during each dialysis session. Others (24%) felt that modifications to the dialysis protocol occur based on patient age or comorbidities. As one RN said,

"For patients with comorbidities like heart problems we are more gentle with the treatment, taking off less fluid and reducing blood flow to reduce stress to the heart. With the healthier ones, usually we maximize everything."

Conclusions

By utilizing in-depth interviews with a broad range of HCPs and caregivers who intimately know HD patients, we were able to identify a range of barriers that prevent more effective treatment in this target population. Our work adds to the growing body of literature that highlights the need for improved symptom management among HD patients. Our results suggest a need for more clearly defined roles for the provision of symptom management, as well as a need for further exploration of potential symptom management strategies—i.e., encouraging use of alternative modalities or adjusting treatment length.

Our study reveals diffuse and often ill-defined roles for providers. That providers are unaware of patient symptoms due to patient underreporting suggests that interventions such as standardizing symptom assessment strategies and providing education to both caregivers and patients/caregivers to enhance patient activation may help bridge the disconnect between the patient's experience and the provider's awareness. Furthermore, symptom assessment and patient/caregiver education could be assigned to specific team members to avoid diffusion of responsibility. Interestingly, in the units involved in this study, pain is assessed by the nursing staff as part of a biannual screen, but physicians are not involved to provide follow-up. Comprehensive quality of life is not routinely assessed by any of the providers.

System-based barriers such as staffing and time constraints may need to be addressed to allow HD team members to take on additional roles related to symptom management. It is important to note that HD treatments are not considered outpatient visits, and patients are not comprehensively assessed each day they present for treatment. Another important system barrier is that providers may not take responsibility for managing symptoms that are felt to be unrelated to dialysis, due to lack of training, experience, or reimbursement. As such, interdisciplinary management strategies may be most effective. Interestingly, a pain consult is available to the providers in this study; however it is rarely used. An outpatient palliative care consult is not available. Broadly, restructuring management to create specific roles and responsibilities among disciplines may lead to optimal utilization of resources.

Creating accountability for symptom assessment, treatment, and follow-up may be particularly important for patients who do not see a primary care provider and rely on the

HD team for comprehensive health management. While we did not assess whether the patients under the care of renal providers have primary care providers, future research to assess symptom management for patients with versus without a primary care provider may be particularly informative in describing how symptom management responsibilities are shared among providers.

Our data further suggest that some providers feel symptoms are unavoidable in HD patients. Further research is needed to better understand the relative contribution of disease states versus iatrogenic symptoms to overall symptom burden in this population and to develop effective symptom management strategies. For example, while a post hoc analysis of the HEMO Study suggested that an increased dose of HD is associated with a small clinical improvement in pain scores and other physical and mental symptoms,¹¹ this was not confirmed by a more recent study.¹² Additionally, while peritoneal dialysis patients may report higher quality of life than patients on HD, arriving at conclusions regarding causality is difficult given the differences between the two patient populations.¹³ Improved symptom reduction strategies require a better understanding of how medical treatments may contribute to the outsized symptom burden in HD patients.

While prior work has identified "nontransplantable" patients as having a higher symptom burden,⁹ some physicians/NPs in this study reported making informal changes to the dialysis prescription (i.e., reducing the goal for fluid removal) for certain nontransplantable patients in order to alleviate symptoms. However, there is no formal process to identify patients most likely to benefit from these changes; nor are these changes implemented consistently or uniformly. As described in our prior work,⁹ we propose that using transplant eligibility status to identify patients at greatest need for aggressive symptom management may serve as an effective tool that can be easily implemented and adopted broadly.

While our open-ended survey framework allowed free expression and facilitated broad exploration of the above topics, our study has several limitations that merit consideration. Our data are limited in that patients were not included in the interviews (this could have provided further insight and perspective), our interviews were limited to providers and caregivers in the New York area, and we did not formally ask each participant if he or she endorsed each theme that may have been raised in other interviews. Therefore, the quantification of themes serves only as a rough estimate for their true frequency. The generalizability of our findings is also limited by the small number of participating providers. Further research is needed to better quantify factors at play in a broader range of clinical settings and to provide further evidence to support system change in the future. Future studies are also needed to confirm the differences among provider groups that have been reported here (i.e., physicians being more likely than other providers to feel that transplant eligibility impacts treatment goals). Finally, patient involvement in future research is crucial, as patient interest is essential for successful implementation of symptom management.

In conclusion, our study builds on a growing body of research that highlights the need for improved symptom management in the HD population.²⁻⁹ The findings of this study are intended to raise awareness, generate discussion, and promote

further exploration of the hypotheses that have been raised. The HD unit is a site of well-developed interdisciplinary collaboration. We can use this interdisciplinarity to design complementary roles in symptom assessment and management. It is important to define models for the provision of palliative care. That is, will palliative care HCPs provide consultation or will renal HCPs assume responsibility? In either case, effective assessment strategies may allow patients to endorse bothersome symptoms. Additionally, determining the efficacy of symptom management strategies such as altering the dialysis prescription may be beneficial. As some oncology programs have replaced "palliative care" with "supportive oncology" to avoid negative connotations, it may also be useful to utilize the term "supportive nephrology" in reference to symptom management efforts in the HD population.

Acknowledgments

This research was supported by the Medical Student Training in Aging Research (MSTAR) program, and a grant from the Weill Cornell Medical College CTSC. The authors also thank the patients, caregivers, and providers at the Rogosin Institute.

Author Disclosure Statement

No conflicting financial interests exist.

References

1. U.S. Renal Data System: *USRDS 2012 Annual Data Report: Atlas of Chronic Kidney Disease and End-Stage Renal Disease in the United States*. Bethesda, MD: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, 2012.
2. Janssen DJA, Spruit MA, Wouters EFM, Schols JMGA: Daily symptom burden in end-stage chronic organ failure: A systematic review. *Palliat Med* 2008;22(8):938–948.
3. Yong DSP, Kwok AOL, Wong DML, Suen MHP, Chen WT, Tse DMW: Symptom burden and quality of life in end-stage renal disease: A study of 179 patients on dialysis and palliative care. *Palliat Med* 2009;23(2):111–119.
4. Davison SN: Pain in hemodialysis patients: Prevalence, cause, severity, and management. *Am J Kidney Dis* 2003;42(6):1239–1247.
5. Watnick S, Kirwin P, Mahnensmith R, Concato J: The prevalence and treatment of depression among patients starting dialysis. *Am J Kidney Dis* 2003;41(1):105–110.
6. Cohen LM, Moss AH, Weisbord SD, Germain MJ: Renal palliative care. *J Palliat Med* 2006;9(4):977–992.
7. Weisbord SD, Fried LF, Mor MK, Resnick AL, Unruh ML, Palevsky PM, et al.: Renal provider recognition of symptoms in patients on maintenance hemodialysis. *Clin J Am Soc Nephrol* 2007;2(5):960–967.
8. Green JA, Mor MK, Shields AM, Sevik MA, Palevsky PM, Fine MJ, et al.: Renal provider perceptions and practice patterns regarding the management of pain, sexual dysfunction, and depression in hemodialysis patients. *J Palliat Med* 2012;15(2):163–167.
9. Berman N, Christianer K, Roberts J, Feldman R, Reid MC, Shengelia R, et al.: Disparities in symptom burden and renal transplant eligibility: A pilot study. *J Palliat Med* 2013;16(11):1459–1465.
10. Hsieh H-F, Shannon SE: Three approaches to qualitative content analysis. *Qual Health Res* 2005;15(9):1277–1288.
11. Unruh M, Benz R, Greene T, Yan G, Beddhu S, DeVita M, et al.: Effects of hemodialysis dose and membrane flux on health-related quality of life in the HEMO Study. *Kidney Int* 2004;66(1):355–366.
12. Chertow GM, Levin NW, Beck GJ, Depner TA, Eggers PW, Gassman JJ, et al.: In-center hemodialysis six times per week versus three times per week. *N Engl J Med* 2010;363(24):2287–2300.
13. Cameron JI, Whiteside C, Katz J, Devins GM: Differences in quality of life across renal replacement therapies: A meta-analytic comparison. *Am J Kidney Dis* 2000;35(4):629–637.

Address correspondence to:
Nathaniel Berman, MD
Rogosin Institute
505 E. 70th Street
New York, NY 10021

E-mail: nab2009@med.cornell.edu