

# Time to Liberate Hemodialysis from Thrice-weekly to Every Other Day Regimen

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## Introduction

Many studies [1-3] have documented significant rise of mortality and morbidity rates after the long inter-dialysis interval which occurs after the weekend period. The rise in all-cause and cardiovascular mortality and hospitalization rates after these weekend intervals is very impressive and can't be left unaddressed. The figures reported for the rise in all-cause mortality ranged from 23% [1] to 41% [2]. The rise in the rates of cardiac mortality and hospitalization after the weekend interval is even more pronounced; R. N. Foley, et al. reported 36% (P=0.007) and 124% rise in cardiac mortality and hospital admission for cardiovascular event (CVE), respectively [1]. T. Springel, et al. reported an admission rate after the weekend interval of 2.6 times the rate in the rest of the week days [3]. An almost similar degree to above hospitalization rate of 2.6 times is the figure of 240% rise in CVE rate after the long inter-dialysis interval that was reported by J. E Hakmei, et al. [4]. These authors reported a rise of 260% in the CVE rate after 3 days gap that can be seen with unusual schedules as that of Mon-Wed-Thu or Tue-Wed-Fri. These hospital admissions may not be that self-limited; the reported high rate of rehospitalization among HD patients is high. Renal Data System has revealed an overall rehospitalization rate of 34% within 30 days of discharge [5]. This fact, indicate a high rate of dragging morbidity after such initial hospitalizations. It is worthy to indicate that the Australian and New Zealand Dialysis and Transplant (ANZDATA) Registry data has revealed the absence of such rise among patients receiving >thrice-weekly regimen [6]. Multiple other studies [7] confirmed such significant rise in both mortality and morbidity rates after the long inter-dialysis interval. This is obviously occurring because of volume overload, disturbed serum electrolytes and uremic toxins accumulation with a background of high cardiac disease prevalence. Overlooked is a the expected long

term pathological consequence even in the absence of acute morbidity events as a result of the weekly repeated episodes of subtle worsening in biochemical and hemodynamic parameters. It is obvious that the electrolyte and acidosis profiles are worst after the long inter-dialysis intervals. Hyperphosphatemia episodes are likely to be contributed to accelerated arterial calcification and hyperparathyroidism. The hemodynamic changes related to subclinical overload, higher BP and arterial stiffness are similarly worst after the long inter-dialysis intervals. These changes are well experienced by all nephrologists caring for HD patients and have also been documented in multiple studies. The interdialytic increase in central wave augmentation index was documented by P. I. Georgianos, et al. to be more pronounced during the 3-day interval; this index reflects the degree of arterial stiffness and has been associated with increased cardiovascular risk [8]. Subtle echocardiographic dysfunction after the weekend intervals have also been documented by M. Obokata [9]. There should be no hesitancy on expecting negative long-term consequences from such exaggerated fluctuations in the patient's biochemistry and hemodynamics after every weekend interval. We can see that the absence of such fluctuations in biochemical and hemodynamic parameters has allowed PD to have relatively excellent outcomes despite its low  $K_t/V$  values.

## Medical Authority Non-Compliance

Compared with compliant patients, those who skipped one or more HD sessions in a month had a 25% higher risk of death (P<0.01) [10]. Higher figure of 33% for the mortality associated with skipping one HD session or more per month was reported also from DOPPS data [11]. Missing a midweek HD session would normally result in a 3-days gap (receiving next HD on the 4<sup>th</sup> day); the rise of CVE rate on the 4<sup>th</sup> day post HD was reported as 260% which was not very different from the comparable figure of 240% after the usual 2-days weekend gap.

We need to pause! Extending the inter-dialysis gap from one to three days by the patient on missing a HD session is considered a risky irresponsible behavior while extending that gap from one to two days by medical authorities on regular weekly basis is an acceptable policy despite above stated terrifying acute and potentially chronic consequences on morbidity and mortality rates. I believe, we have to admit that our 'religious' adherence to the thrice weekly HD schedule is another form of non-compliance. It is something that needs to be rectified if we are really looking for improving our patients' survival on HD.

## Monthly rather than Weekly based HD Solution

It is unavoidable to have such long inter-dialysis intervals as long as the HD sessions are arranged on a weekly basis. Earlier suggestions to address the problem of long inter-dialysis interval were not practical because of the intrinsic limitations imposed by looking for a solution within the “week box”. Such suggestions included the provision of a 4<sup>th</sup> weekly HD session on either Saturdays or Mondays (The days before and after Sundays). Of-course, that’s not practical because of the limited capacity in the staff and available HD slots in most of HD units which would not allow accommodating all patients together every Saturday and Monday. Doubling the number of HD staff and machines will then be needed on Saturdays and Mondays. The same can be said about the other suggestions of short daily HD and long nocturnal in-center HD approaches. Home hemodialysis is a true alternative approach though its acceptance is still limited to a small proportion of the HD population.

I believe we need to liberate our HD schedules from being stuck with those weekly schedules. An approach of providing regular HD treatments on every other day (EOD), odd vs even days of each month, regardless of the week days constitutes a simple, practical solution to eliminate the long inter-dialysis interval. The HD schedule will be based on monthly rather than weekly basis. With appropriate explanation, the dialysis medical staff is likely to accept such approach as is already being practiced by their emergency and critical care units’ colleagues and as it will eliminate one major defect in the validity of hemodialysis as a RRT modality. To further justify this suggestion, I would like to indicate the following additional points:

1. Patients, especially new patients, are expected to accommodate themselves easily to the prescribed schedule of every other day HD therapy as they do to the rest of their scheduled medications and therapies. This suggestion is made to help compliant patients who constitute the majority of the HD patients. Patients’ non-compliance will not be eliminated by this approach but likely to somewhat safer. HD units will have two fixed schedules (either even or odd days of each month) either of which will be distributed to each patient before the beginning of every month; i.e. the HD schedule for each patient will be on either even or odd days of that month rather than on fixed days of the week. Such monthly based schedule of receiving HD on odd or even days of the month will normally get exchanged following months with odd number of days (31 or 29 days). Among the patients, the weekend days will be equally distributed between the two groups.

2. The dialysis medical staff has already scarified half of their weekends by working on Saturdays. That was half a solution that helped avoiding a 3-days weekend HD gap; but as I discussed above, the current 2-days weekend gap is still unsafe. Yielding to medical facts and for the sake of saving their HD patients, I would expect the acceptance of the majority of our renal staff to work on Sundays and have their weekends distributed throughout the week.

3. Additional benefits from adopting EOD HD regimen would be seen in getting our monthly lab tests more accurately reflecting the true consistent pre-dialysis status than the usual midweek lab testing that stays blind for the electrolytes state after weekend interval. This monthly based schedule would help avoiding the usual overcrowding

of the patients on Saturdays and Mondays because of the need for extra dialysis session by many patients.

4. The reported finding of eliminating the long inter-dialysis interval associated morbidity and mortality on increasing the frequency of HD session to four or more sessions per week does suggest a similar success by the easier approach of adopting the monthly based (odd vs even days) every other day HD schedule. I believe that such schedule is practical and needed step to improve patients’ survival on HD besides the currently recognized alternative choices of Home hemodialysis and frequent in-center HD.

## Conflict of Interest Statement

None declared.

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